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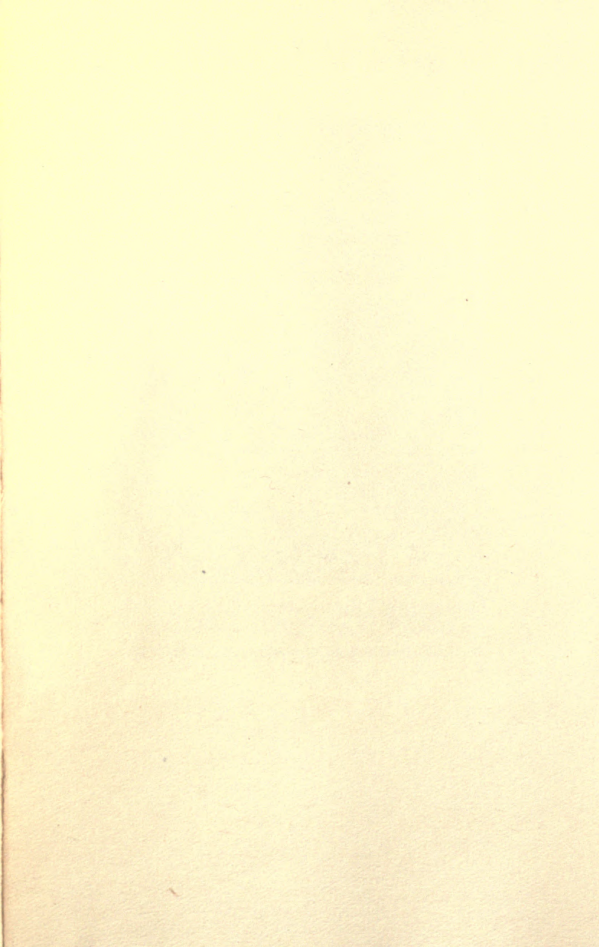
IRELAND : THE LAND AND THE LANDSCAPE



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IRENE DWEN ANDREWS



Ireland : The Land and the Landscape

A Geography for
Schools & Travellers

BY

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THE EDUCATIONAL COMPANY OF IRELAND
LIMITED

PREFACE.

THIS book is intended for classes and for individual readers who possess a slight general knowledge of geography. A map of Ireland should always be at hand, and a teacher will easily give help to pupils in the matters dealt with in the first five chapters. Ten or twelve specimens of the chief rocks that build up Ireland should be part of the equipment of the school, and some of these can be well collected by the class. The description of the country in Chapters VI. to IX. contains a number of local details which may arouse interest, when the reader says to himself, "I have seen that," or "I know that very corner." The teacher may well begin with the country round about the school, and may mention a great many of its surface-features, aided by the Ordnance Maps, beyond what is briefly touched on here. Old traditions and historic events add greatly to the interest of such descriptions; and the beautiful Irish place-names, which are so often ruined by the spelling on our maps, constantly remind us of the curves of hill and dale, or connect these

PREFACE.

land-forms with the movements of man, with fights and forays, or with the establishment of seats of learning in the past. Books like P. W. Joyce's "Irish Names of Places" and "Short History of Ireland," and J. Cooke's edition of Murray's "Ireland," readily suggest themselves as guides. But the history of Ireland goes far back beyond what man has written, and is bound up with that of the great globe itself. Those who live in Ireland should know their country well. If these few pages should help anyone to know and love it better, the author will have received his best reward.

G. A. J. C.

Carrickmines, July, 1914.

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Ireland : The Land and the Landscape.

CHAPTER I.

IRELAND AND THE GLOBE.

1. The Earth is a great ball, 7,900 miles across, or 25,000 miles when measured round about. Ireland is a patch of land on its surface, surrounded by water, measuring about 250 miles from north to south and 180 miles from east to west. Owing



FIG. 1.—Ireland on the Globe.

to the way in which the sea forms notches in the coast-line, the area of Ireland is only about 32,000 square miles, and it would take 6,250 Irelands to cover the surface of the globe,

2. Every part of the earth depends in some way on the other parts, and the first step towards the understanding of what goes on in Ireland is a knowledge of her position on the curved surface of the globe. In Fig. 1 we are looking at the earth from a long distance away in space, and Ireland appears in the northern half of it, as an island on the eastern edge of the Atlantic, and as an outpost of the region known as Europe. That outpost, however, contains almost all that is dear to the people who have been born and dwell in it.

3. Look, now, at its position. It lies outside the tropics, so that the sun's rays never fall vertically upon it even in the hottest season of the year. It lies well south of the Arctic circle, so that its climate, as geographers say, is temperate. The great ocean lies to west of it, and the winds usually blow across it from the south-west. These winds drive forward warm water from the tropics, and are themselves warmed by the water under them. In winter, when the sun's rays fall on the Irish region more slantingly than in summer, and when the nights are longer than the days, the land cools down rather quickly; but the ocean-water loses its heat far more slowly, and thus provides a storehouse of warm air that raises the temperature for dwellers on the land. In summer the water does not grow hot so quickly as the land, and consequently Ireland is kept at a much more uniform temperature than many other places situated at the same distances from the equator and the pole. Labrador, for instance,

has a very cold winter, since the principal winds blow over it from the continental land, while those coming from the sea cross the water that streams down its east coast from the north. This polar current carries icebergs from Greenland far south into the Atlantic, while in the Irish region the warm water melts the Arctic ice, and prevents the floating masses from coming farther south than the Faroe Islands.

4. Ireland and the larger island of Great Britain are seen to lie close against the coast of Europe. They do not rise from the floor of the deep ocean, like the Sandwich Islands or Tahiti in the Pacific waters. Soundings show that the sea is shallow on the east of Ireland, while on the west a platform extends for some distance under the surface of the Atlantic, until we reach a depth of about 300 fathoms (1,800 feet), after which there is a steeper slope down to 1,500 fathoms. The map (Fig. 2), on which the depths are shown by dotted lines, tells us that Ireland is truly a part of Europe. The sea between it and Great Britain is for the most part about 50 fathoms (300 feet) deep, though 144 fathoms of water occur between Belfast and Port Patrick, and 110 fathoms north of Rathlin Island. The North Sea between England and the Continent is even shallower, and the famous Straits of Dover, so often storm-tossed, are barely 20 fathoms (120 feet) in depth.

5. Europe, again, is greatly penetrated by the sea, and forms a sort of ragged western fringe



FIG. 2.—Map showing depths in fathoms of the sea round Ireland

to the greater continent of Asia. Just as Arranmore, Inishbofin, or Clare Island lie off Ireland, while the sea stretches inland to the east of them, so Ireland lies off the western edge of the enormous mass of land known as Eurasia, or Europe and Asia considered as a whole. The sea stretches eastward from it far into the heart of Europe.

6. The greatest mountains and the greatest ocean-depths of the world measure about 30,000 feet (say $5\frac{1}{2}$ miles) respectively above and below the level of the sea. If we think how little this is in comparison with the distance from the centre to the surface of the globe, we see that the continents are in reality very small bulges on this surface. The oceans, instead of being deep basins, such as we can make by pressing our thumb on a hollow rubber ball, are in reality like basins turned upside down, on which the water is held by the attraction of the solid earth below. They are so broad in proportion to their depth that the curve of their floors is outward, like that of the earth's surface as a whole. The continents and oceans, and the chief irregularities in them, result from upward and downward movements in the earth's surface. The skin of the earth, as we may call it, wrinkles and changes its form, sometimes very gradually, sometimes more rapidly, but always slowly in comparison with our human lives. Hence a large area that is now above the sea-level may at one time have lain beneath the water. On the other hand, continental land may have formerly stretched

where now the liners steam across the ocean, four thousand miles from shore to shore.

7. We know that these movements have gone on in the past, since we find in our solid rocks, such as the grey limestone of Ireland, abundant remains of shell-fish and corals and teeth of fishes that once must have lived in marine waters. These occur not only in low-lying plains, but uplifted thousands of feet on mountain heights. The sea at the present day lays down shells and other relics of dead animals in layers one above another, by its continual sway and its motion on the shores. Its waves mingle sand with the shells, or wash out fine mud to a greater distance from the coast, where it gathers to form new beds of the rocks that we know as clay and shale. Shale is merely a clay well arranged in layers by water action. When further squeezed and hardened it becomes slate. Where the sea is pure, the shell-fish and other animals that make their hard parts of carbonate of lime leave behind thick deposits almost free from mud or sand. These deposits in time become limestones. Where, on the other hand, sand accumulates, consisting mostly of grains of the hard mineral quartz, which are left behind from the decay of older rocks, the deposits are likely to be preserved and hardened in the course of time as sandstones. In sandstones the little mineral grains are stuck together by various natural cements, such as carbonate of lime, or even silica, which sets between the grains as so much additional quartz.

The rock, in the latter case, is known as **quartzite**, and becomes almost as splintery and hard as flint. Hence sandstones are for the most part hard resisting rocks when, by the mysterious movements of the earth's skin, they become lifted above the waters in which they were originally laid down. Clays and shales, the consolidated muds, are softer and are more easily worn away. Limestones are compact rocks, broken across by clean straight joints, and they often give rise to natural steps and terraces when they are raised to form dry land. They are, however, liable to be worn down more readily than other rocks, since their material, carbonate of lime, can be dissolved in rain-water. The gas carbon dioxide, which exists in small quantities in the air, is brought by the rain like a mild acid against the rocks. It thus enables the natural waters, as they run over the surface or down the crevices, to carry away limestone in solution. The joints are in consequence widened, the surface is lowered, and great caves and waterways are hollowed out in the limestone masses underground.

8. Hence there are resisting rocks and less resisting rocks for the weather to act upon when any part of the outer skin of the globe is exposed above the sea. In the process of **weathering** or **denudation**, the rainwater and the frost, the battering winds, the flowing streams, and the surf of the sea, all play their part.

9. Besides the occurrence of rocks containing marine shells on the very crests of mountains, the arrangement of the rocks themselves shows that the skin of the earth becomes wrinkled into folds. The beds of rock, or **strata**, which were laid down fairly evenly in seas or lakes, are found to be crumpled and disturbed, and the weathering

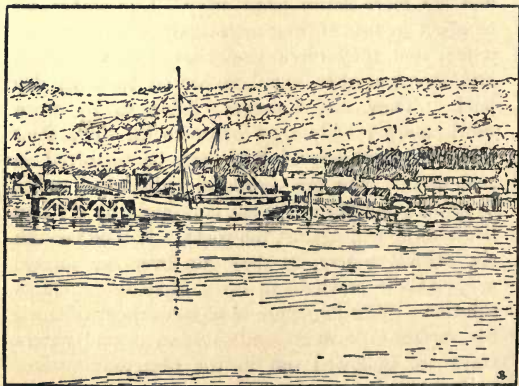


FIG. 3.—Old Red Sandstone strata resting on older and upturned slates, Waterford.

action often reveals their upturned edges. Sometimes the strata stand absolutely on end, as may be seen in parts of Bray Head or along the riverside at Waterford. Beds of **stratified** rock have been disturbed in this way again and again in the history of any country, for we find one series of rocks

laid down on the uptilted and weathered edges of another series, and both these series uplifted, attacked by denudation, and perhaps again submerged

10. At Waterford, for instance, the purple-grey sandstones known as the Old Red Sandstone lie in thick beds across the upturned older slates (Fig. 3). Above Leenane, in County Galway, some of the oldest rocks of Ireland are overlain in a similar way by strata older than the Old Red Sandstone. Hence Ireland was twice under water and twice lifted up again high and dry before even the Old Red Sandstone was laid down.

11. During such movements, molten matter may ooze in from hot places in the interior of the earth. Cracks may open in the surface, and volcanoes may appear, spouting forth gases and fragments of rock, and sometimes sending out the molten matter as lava-flows across the land or the sea-floor. Where an earth-fold has been arched up and molten matter has risen beneath it, this matter may cool very slowly under the arch, instead of breaking through and forming lava. It will then become crystalline; the various mineral substances that it contains will separate themselves out as the well-shaped bodies known as crystals, and the resulting rock will be tough and resisting, and will often stand out on the earth's surface when the strata that formerly covered it have been removed by denudation.

12. Rocks that have cooled from a molten state, whether as lavas or underground crystalline masses, are styled igneous, from *ignis*, "fire." They play an important part in the building of a country such as Ireland. The dark lavas of Antrim, known as basalts, and the crystalline granites of the Mourne Mountains and the Leinster Chain, are alike igneous rocks.

13. Moreover, the strata themselves may become altered and crystalline by the heating and squeezing that they suffer during movements of the earth's skin, and during their invasion by molten rock from below. Clays and shales in this way pass into the gleaming rocks styled mica-schists. The shining platy mineral mica, which is found also in granite, develops in them and forms the great part of the resulting mica-schist. Limestones become changed into crystalline marbles, losing all traces of any shells or corals or remains of other animals that they may have contained. Strata may be penetrated by sheets of molten granite, and become changed into layers of schist, which have layers of granite between them. Granite itself may be crushed and squeezed by earth-movements until it has a streaky structure, almost like a schist. These coarsely streaky crystalline rocks are known by the old Saxon name of gneiss.

14. In Ireland, then, on the edge of a continent formed of all this variety of materials, we may expect to find many types of rock, and many kinds of scenery carved out from them by the

weather. Moreover, on the edge of the great ocean that stretches westward, we may expect to find successive records of overflowing by seawater and recovery of the land. The present outline of Ireland is due both to sinking and upheaval. In some parts, moreover, the sea is rapidly changing the form of the coast, by undermining hard rocks or washing away soft shores of clay or sand.

15. Where the edge of a country has been stationary for a long time in regard to the adjacent sea, a broad stretch of sand and mud is formed by the material that is washed down from the coast. If an uplift occurs, this gently sloping border appears above the sea and forms a **coast-plain**, on which the rivers run outwards from the land. The rivers cut new channels in the coast-plain, and tend to deposit the material again in the sea as they emerge on the new margin of the country. No large coast-plain exists at present on the Irish shores. On the other hand, when a country is lowered, the sea flows in up the valleys that were cut by streams, and may penetrate far into the land. There will thus be a number of **drowned valleys** on the coast. A few peaks of the sunken land will now appear off the shore as islands. These features occur frequently in Ireland.

16. Since the land swings up and down, even while it is sinking or rising on the whole, **raised beaches** may be found on the sides of inlets of the sea. These beaches contain shells like those in the water

near at hand, and lie well above the present sea-level, perhaps a hundred feet or more. They show that the submergence was once greater than it is now, and that there has been a recovery which was sufficiently rapid to carry the beach upward and to allow the next beach to gather some feet lower down. If the movement had been very slow, a continuous beach would have been formed, stretching from the top of the uplifted portion down into the present sea. An earthquake in Alaska in 1899 raised a part of the American coast as much as 47 feet in a single stroke. Rapid uplifts or downsinkings of a few feet at a time have very likely taken place in Ireland.

CHAPTER II.

THE CLIMATE OF IRELAND.

1. Ireland has a temperate climate, which is due, as we have already seen, to its position on the globe and to the warm winds blowing over it. Let us now consider this more carefully. We can easily understand Figs. 8 and 9 with the help of a globe. They show, in fact, sections of the globe, that is, the earth has been drawn as if it were cut through the middle.

2. **The Earth and the Sun.**—The earth turns round once in every twenty-four hours about a line joining the north and south poles. It is just as if a big knitting-needle were stuck through it, on which it could be turned. No such support really passes through the earth, though we have to put something of the kind in our models of the earth, that is, in the globes that are made for schools. The line represented by the knitting-needle is called the earth's axis. This line points to the pole-star in the sky, which is so named because it is over the north pole.

3. The sun is so very far away that the rays of light from it may be drawn as falling parallel to one another on the earth. The rays from a lamp shine out in all manner of directions. So do those of the sun ; but the earth is so small and so far away from the sun that it receives only the rays that come,

as it were, along one of these directions. This may be understood by comparing Figs. 4 and 5. In Fig. 4 a large earth is shown near a small sun,

FIG. 4.

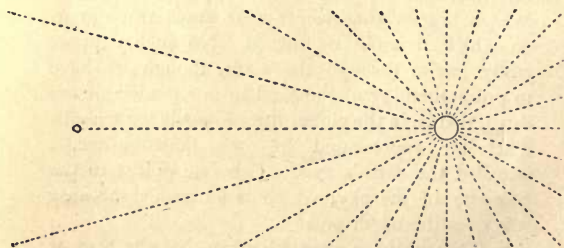
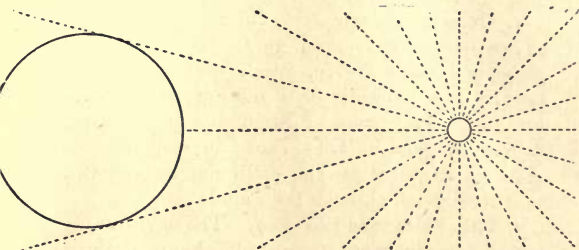


FIG. 5.

and it receives a number of rays of light starting in different directions from the sun. In Fig. 5 a very small earth is shown, the sun remaining the same size and at the same distance, and most of

the rays from the sun miss it altogether. Hence in Figs. 8 and 9 all the rays are shown as coming in the same direction, that is, parallel, from the sun, and the sun cannot be got into the picture.

4. The earth's axis always points to the pole-star, and it happens not to be at right-angles to the plane which contains the sun's rays that reach the earth. The earth, moreover, moves in 365 days round the sun. Hence at one point the axis will slope with the north pole directed as much as possible towards the sun, and at the opposite point of its course the north pole will be directed as much as possible away from the sun. We know that a complete circle is divided for purposes of measurement into 360 equal parts, called degrees, and we use these degrees to measure the slope of one line to another. The earth's axis slopes at $66\frac{1}{2}$ degrees to the plane containing the sun's rays that reach the earth, that is, to the plane of its orbit or course round the sun.

5. Now let us take a globe, with Ireland marked on it. A man standing, like Captain Peary, at the north pole, has the pole-star directly over his head. A man standing in the middle of Ireland has some other star over his head. He can see only a small part of the great curving surface of the earth round about him. What he sees is just like a flat plain. Unless he is at sea and watches how ships disappear, first the hull and then the masts, on the horizon, he cannot tell that the surface is curving away from him on all sides. What he sees,

bounded by the horizon, may be called the plane of the horizon.

6. Take a circular bit of card or a thin circular plate of wood, stick a pin upright in it, and lay it on Ireland on the globe, so that the pin points down through the centre of Ireland to the centre of the globe. The outer end of the pin then points to that part of the heavens which would be just over the head of a man in the centre of Ireland. Push the pin down into the globe to hold the little board of paper or wood firmly in this position. The board represents the plane of the man's horizon.

7. Now suppose that the sun lies somewhere to the right of the globe, and stand the globe with its north pole directed as much as possible towards the sun. In this position, owing to the slope of the axis, a point in the northern hemisphere remains longer in daylight than in darkness during the twenty-four hours of a complete spin round on the axis. The days are thus at this position longer than the nights. Moreover, when any point in the northern hemisphere comes round so as to be exactly facing the sun, that is, when it is noon at that point, the sun's rays fall at the steepest possible angle on the horizon-plane of that place. In this position of the earth's axis, the rays fall vertically on a line of latitude $23\frac{1}{2}$ degrees north of the equator. It is midsummer in the northern hemisphere.

8. Now see what happens in the latitude of Ireland. Stick a knitting-needle in the cork of a

FIG. 6.

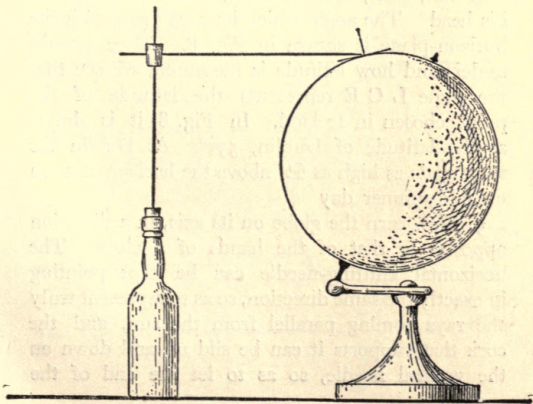
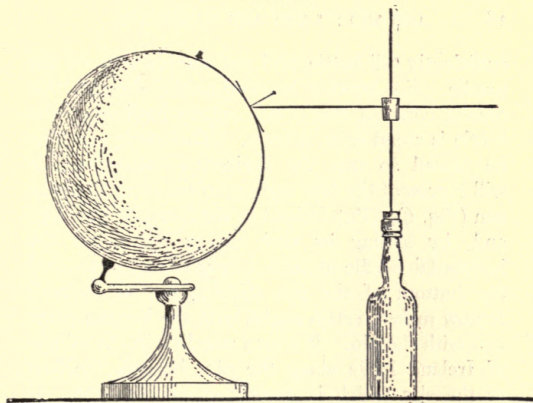


FIG. 7.

sufficiently tall bottle, and put another cork on the needle. Fix another knitting-needle through this second cork, so that it lies exactly level when the bottle is stood upon a table. The bottle can now be placed so that the horizontal knitting-needle will represent the rays coming to the earth from the sun (Fig. 6). Put Ireland in the noontide position, and, by sliding its cork up or down, set the horizontal needle at such a height that it touches the bottom of the pin sticking out of Ireland. It now makes certain angles with the horizon-plane and with the pin. If a man standing in the middle of Ireland looks along the pin, he sees the part of the sky which is exactly above his head. If he looks along the knitting-needle he sees the sun. The sun, then, even at noon, is not directly over his head. The angle which its rays make with the horizon-plane is shown in Fig. 8. If we already understand how latitude is measured, we see that the angle $L C E$ represents the latitude of the point chosen in Ireland. In Fig. 8 it is drawn as the latitude of Dublin, $53\frac{1}{2}^{\circ}$. At Dublin the sun stands as high as 60° above the horizon at noon on midsummer day

9. Now turn the globe on its axis, in a direction opposite to that of the hands of a clock. The horizontal knitting-needle can be kept pointing in exactly the same direction, so as to represent truly the rays coming parallel from the sun, and the cork that supports it can be slid up and down on the vertical needle, so as to let the end of the

FIG. 8.

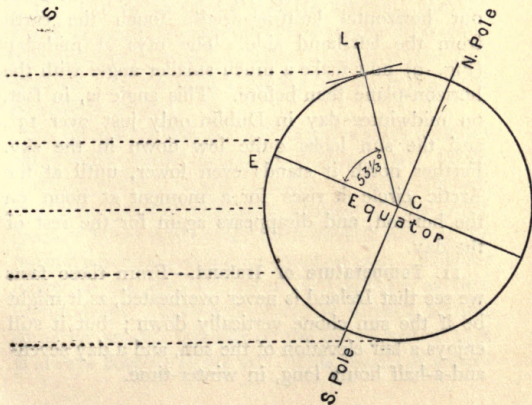
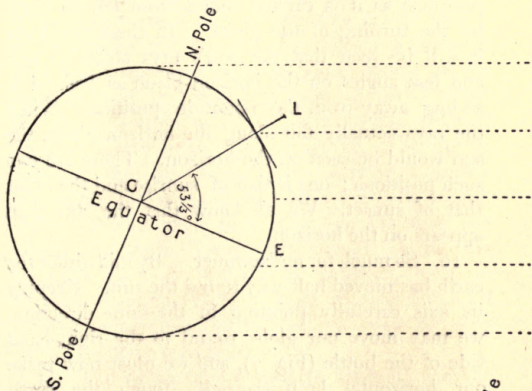


FIG. 9.

horizontal needle touch Ireland in any of its positions as it is carried round from left to right by the turning of the globe. In these positions it will be seen that the sun's rays strike at less and less angles on the horizon-plane as Ireland is swung away from the noontide position. When the rays actually fall along the horizon-plane, the sun would be seen on the horizon. There are two such positions ; one is that of sunrise and the other that of sunset. We all know that the sun then appears on the horizon.

10. So much for midsummer. By midwinter the earth has moved half-way round the sun. Keeping its axis carefully pointing in the same direction, we may move our globe round to the right-hand side of the bottle (Fig. 7), and we must now make our horizontal knitting-needle touch the earth from the left-hand side. The rays at mid-day (Fig. 9) now make a much smaller angle with the horizon-plane than before. This angle is, in fact, on midwinter day in Dublin only just over 13° , and the sun looks quite low down in the sky. Farther north it stands even lower, until at the Arctic circle it rises for a moment at noon on the horizon, and disappears again for the rest of the day.

11. *Temperature of Ireland.*—From these facts we see that Ireland is never overheated, as it might be if the sun shone vertically down ; but it still enjoys a fair elevation of the sun, and a day seven-and-a-half hours long, in winter-time.

12. In July and August, the hottest months, the temperature of the air on the surface of Ireland is generally about 60° of the Fahrenheit scale ; in December and January, the coldest months, it does not often reach freezing-point, except on the uplands, and is usually as high as 40° . When the air at Dublin is at 40° , that on the Atlantic coast of Kerry is as warm as 46° or 47° ; but in summer the sea keeps the western country somewhat cooler than the interior of the island, since the land gains heat more quickly than the water. Southern Tipperary appears to be the warmest part of Ireland in summer, with an average air-temperature in July of over 62° . Of course, temperatures of 70° , 80° , or even 90° may be occasionally recorded.

13. The ocean to the west of Ireland, and the water all round the country, help greatly in keeping its temperature uniform, as was stated in the first chapter. At the same time the climate is rendered somewhat moist.

14. **Water in the Air.**—The air always contains some water-vapour among its various gases. When warm, there is a larger quantity of water-vapour, and consequently a smaller amount of the other gases. When warm moist air is cooled, some of the moisture becomes visible as cloud or mist. It is no longer in the state of vapour, but appears as tiny liquid drops. Each little drop is formed around some far smaller particle of the dusty matter that is always floating in the air. This return of water-

vapour to the liquid state is known as **condensation**. On further cooling, these drops may run together and form larger ones, which can no longer be supported in the air. These larger drops are rain-drops, and fall to the ground.

15. The air of the winds that blow across Ireland gathers water as invisible water-vapour from the sea. The water is said to **evaporate**, as when it "dries up" out of a basin. Most of these winds come from the south-west across the warm Atlantic. They are warm, and consequently bring more moisture with them. Why does this moisture fall when it reaches the land ?

16. Ireland has hills nearly all round its margin. When the winds blow in on it, the air is forced to rise over these hills. The earth becomes warmed by the sun, and warms the air above it ; but as we go up a hill we get farther away from the general surface of the earth. The mercury in the thermometer drops 1 degree Fahrenheit for every 300 feet that we ascend. Consequently, the air reaches colder regions as it is driven up over the hills. The following fact, however, is of still greater importance. The air, as it rises to these regions, has less air pressing on it from above. Hence it expands, and becomes much colder in so doing. If it already contains nearly as much water-vapour as is possible for its particular temperature, it may easily reach a level where this vapour must come out in a visible form in consequence of the general cooling down. Clouds

are then seen hanging round the mountain-crests, and extending out upon the seaward side. On the other side of the hills the air is clearer, for it has lost some of its moisture by the making of the clouds or the falling of rain.

17. If the amount of water-vapour in the air is small, it may not become visible until its temperature is reduced to 32° or less. In that case it is condensed at or below the freezing-point of water, and appears in the form of ice. **Hoar-frost** may thus be produced at the level of the ground, and **snow**, which is a sort of floating hoar-frost, in the air. Snow consists of delicate crystals of ice, like those of hoar-frost, meshed together as **snow-flakes**. The upper parts of our hills are often covered with snow, while the lower slopes receive only rain. This is because there was more water-vapour in the lower part of the air when cooling and condensation set in, and some of the water became condensed at a temperature well above the freezing-point. Rain fell, then, in this region, while higher on the hillside the temperature had to be reduced below freezing-point to bring out the moisture from the drier upper air.

18. Snow falls more often in the north of Ireland than in the south, because the sun's rays fall more slantingly on the surface the farther we go from the tropics, and it is the temperature of the earth's surface, whether land or water, that controls the temperature of the air above it,

19. **Rainfall.**—The quantity of water deposited from the air as dew, hoar-frost, rain, or hail, at any place during an average year is called the **rainfall** of the place. The condensed moisture is collected by observers in **rain-gauges** every day, and the total depth to which it would have covered the ground at the end of the year, if none had run off or gone back as vapour into the air, is measured up in inches. In the east of England, where the wind often blows from the dry lands of the continent of Europe, the yearly rainfall is as low as 25 inches. In Ireland, even in the plain-land, it is commonly near 40 inches, and it runs up to 80 and probably 100 inches in the western hills.

20. We can make a map (Fig. 10) to show the rainfall of various parts of Ireland, and anyone who knows the country will at once see how the districts of greater rainfall contain a good deal of high ground.

21. The driest part of Ireland is an area between Balbriggan and Dalkey on the east coast, where the rainfall is below 30 inches. The Mourne Mountains make a wet patch a little to the north ; but on the whole the east and centre of Ireland have less than 40 inches of rain. The influence of the high range of Leinster is well seen on the map, and rain is deposited on this, not only from winds that sweep across the plain, but also from the south-east winds, as they are forced to rise upon the mountain-sides. The whole west of Ireland is wetter than the east. There are not many

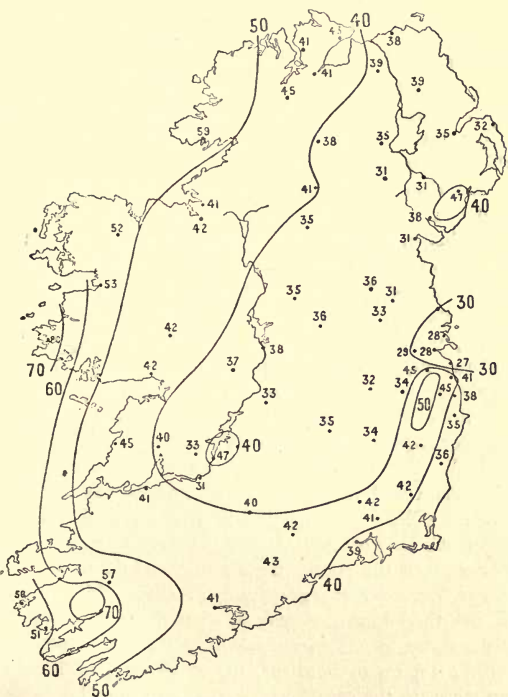


FIG. 10.—Rainfall Map of Ireland.

observing stations in the wilder districts to guide us in drawing rainfall-lines upon the map; but we can see how the winds from the Atlantic drop rain on the mountains of Donegal, Mayo, and Connemara, while the grand masses near Killarney bring the rainfall above 60 inches over quite a third of Kerry

22. **Winds.**—The fact that warm air is lighter than cold air, and that water-vapour is lighter than the other gases that form the main bulk of the air, prevents the air from remaining still. The balance of one part of the air against another is continually being disturbed. The heating of the land-surface at any point causes air from colder regions to push its way in, by reason of its greater weight. This is the main cause of winds. Air from the poles is thus always forcing its way down towards the equator, where, all the year round, the air is highly heated. But the air pushed up at the equator expands, cools, and descends again on its way back to the poles. Ireland lies in the track of this returning flow of air. Hence the wind commonly blows from the southern part of the Atlantic.

23. Moreover, this great body of air has eddies on it, like the eddies that may be seen whirling round upon a stream. These whirls of wind, or **cyclones**, with a region of light air, or, as we say, of **low pressure**, in the centre, move round in our hemisphere in the opposite direction to the hands of a clock. When there is a great difference of pressure between the air at the centre of the eddy and that

which tries to push in from the outside, serious storms may arise. These storms are carried on the main air-currents over Ireland and move away with them to the north-east. Owing to the whirling movement of the winds that form the eddy, the direction of the wind at any point of the country shifts as the storm advances. Ireland is struck by one part of the eddy as it approaches, and emerges at another part as the storm drifts away. When the differences of pressure are not so great in a short distance, similar wind-whirls are produced, but the force of the wind is less and the cyclone does not produce a storm.

24. The Climate of Ireland in Past Times.—

As we have said, snow falls more often in northern Ireland than in the south, and it falls still more often and lies longer in the Scottish Highlands, and still more often, again, in Scandinavia and Spitsbergen. Near the poles, the sea itself is frozen all the year round. If from any cause the temperature of the whole earth could be lowered, the frozen sea would extend farther south in the northern hemisphere, and farther north in the southern hemisphere, and the snowy regions would also spread towards the equator. Ireland might become so cold as to be covered by snow throughout the year.

25. At the same time, a still deeper mantle of snow would gather in Scandinavia, and would also grow and grow in thickness. At last it would be so thick that its lower parts would be squeezed

into solid ice and would be pressed out as great ice-streams or glaciers spreading into other lands. In Ireland also glaciers would form, and would flow slowly down the valleys, as they do to-day in the higher parts of Switzerland. If the cold time continued, the ice-masses would join one another in the Irish lowland, and would form a great continuous mass, squeezing out somewhere to the sea. But the same conditions would affect all northern Europe, and the ice from various places where the snowfall was greatest would meet in huge sheets and cover a great extent of country. It is difficult to imagine such a thing as occurring in our temperate lands to-day.

26. Yet an **Ice-age**, called in bigger terms a **Glacial epoch**, actually occurred about the time that man was beginning to establish himself in Europe. Its effects in Ireland were so profound that we must consider the climate of the country in the past as well as that of the present day.

27. Whatever was the cause of the cold age, it no doubt came on gradually, and gradually passed away. Sometimes, moreover, warmer years set in, and for a time the snow and ice melted from the lower grounds. But in Ireland, when the cold was greatest and most continuous, glaciers covered the hills and plains alike. The gathering-ground of the snow was mainly between Galway and Lough Neagh, and ice spread northward and westward and southward from mountainous masses of snow that became piled up in this region.

28. The Scottish Highlands also sent down ice that invaded the north and east of Ireland, and the ice from Scandinavia crossed the North Sea and invaded the east of Scotland and of England. Under these circumstances, the warm south-west winds from the Atlantic probably ceased to blow. The Atlantic itself was colder ; moreover, the heavy cold air over Ireland forced itself out seaward.

29. The Irish region by that time had long been exposed to weathering. Its surface was covered with deep soils and with blocks that had fallen from the hills. The rocks at the surface became still more broken up by the frequent frosts that set in as the Ice-age grew. The glaciers gathered all this loose material into their lower parts as they spread across the country. With this burden of clay and sand and stones, they scratched the rocks beneath them and wore down and smoothed whole mountain-sides (Fig. 11). By movements within the ice, the blocks became also scratched and rounded. When the ice finally melted away, masses of loam full of scratched stones were left on the surface of the country. These are known as **boulder-clays** (Fig. 15). The limestone blocks in them show the scratching especially well. Where the boulder-clay was irregularly arranged in the great glaciers, it melted out in the form of round-backed hills, about 100 feet in height, which look something like great pigs lying down. These are known by the Irish name of **drumlins**, which was chosen for them by the geologist Maxwell H. Close.

Sometimes huge transported boulders (Fig. 24) have been dropped down on rock-surfaces of quite another character, like the Cloghvorra, east of Kenmare, which is a mass of limestone resting upon

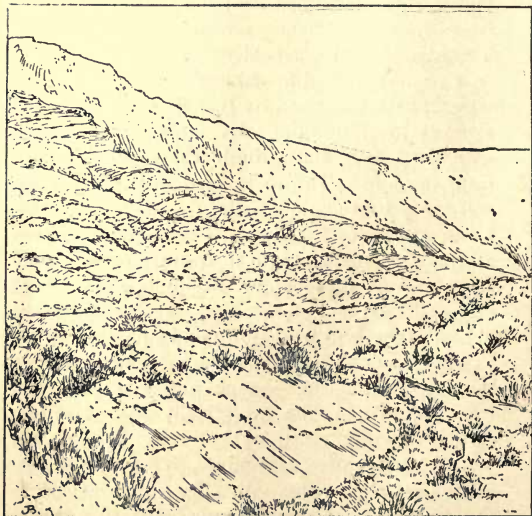


FIG. 11.—Ice-worn rocks in the Gap of Dunloe.

Old Red Sandstone. Material carried in or on glacier-ice and left behind when this has melted is known by the general name of moraine.

30. As the Ice-age was passing and the glaciers grew thinner, they melted from their bottom

surfaces against the warm earth, as well as from their tops against the air, and rivers ran in cracks and channels beneath the ice-sheets. Stones fell out of the ice into these channels, and were rolled along as pebbles. When the ice disappeared, the lines along which the streams flowed remained marked by ridges of sand and gravel, winding like the former courses of the streams beneath the ice. These ridges are now usually covered with grass, and roads are sometimes carried along their crests. They are called eskers, another Irish name, and are often known as "green hills" in the country. There is an old village named Esker, built on hillocks of glacial gravel, west of Dublin. The eskers in Roscommon and King's County run like great walls across the country.

31. The boulder-clays rest upon scratched surfaces of rock, showing that they were laid down out of ice-sheets that moved over the land. In the Arctic regions at the present day, we find glaciers of this kind, full of stones and boulders in their lower layers. In Spitsbergen they may be seen coming down from heights of three thousand feet into the lowlands, just as they once did in Ireland, and spreading out into the sea. Where they have melted back, they have left masses of boulder-clay, exactly like that which we find so commonly in Ireland. The pebbles of limestone and shale in these Arctic boulder-clays show smoothing and scratching like those of the clay-pits in the Irish plain.

32. While the ice-sheets were melting from

Ireland, floods of water were produced, which washed the fine clay out of many of the boulder-clays and often left only a sandy gravel on the surface. The water spread out these gravels in layers ; but the scratches on the stones often remain to prove that they were once held in the ice. Such gravels are seen on the sides of the Dublin Mountains and over a large part of the county of Wexford.

33. When a milder climate returned, forests of fir and oak grew in Ireland ; but wetter years set in from time to time, and the mosses that love watery places spread and flourished until they formed peat-bogs, both in the plain and on the hills. Many of the bogs in the lowlands arose from the choking up of lakes. At present the climate is again drier, and much of the mountain-peat is being stripped off from the higher ground by wind. Here and there you may see a little patch of peat remaining on the top of a great ice-borne boulder, which was once buried in the bog, and which has now come to light by the wasting away of the dry peat round it.

34. To understand, then, what we see on the surface of Ireland, we must understand some of the changes of climate in the past. In our first chapter we saw that the district where Ireland now lies was at one time beneath the sea and was at another time united with the Continent. Its present climate depends very much on its surroundings, and here again we have to think of Ireland as part of the great and ever-changing surface of our globe.

CHAPTER III.

THE COASTS OF IRELAND.

1. When the early inhabitants landed in Ireland, they must have been pleased to find that the interior of the island was less mountainous than the coast. Between Dublin and Wexford there is a fringe of lower ground ; but the long range of the Leinster Chain rises only ten miles inland. North of Dublin there is nothing to prevent us from entering the country until we reach the region of the Mourne Mountains. The interior of Down is a hilly land for strangers, and anyone getting round into Belfast Lough finds a great black cliff of basalt crowning the high ground all along the coast to Cushendall. The same feature is seen from Fair Head to Limavady, and then we meet the mountain land of Donegal. In the west of this county the cliffs rise 2,000 feet from the water's edge, and even at Sligo huge limestone crags appear as a background to the peat-lands of the coast. The Ox Mountains form a barrier from Sligo to Ballina, and the bog-covered hills of Mayo put fifty miles of barren country between the sea and the inner grazing-lands. The conical mountains of Mayo, weathered out of quartzite (p. 102), are repeated in those of Connemara. Terraces of limestone rise a thousand feet above the south side of Galway Bay, and the sandstone

Cliffs of Moher form a grim wall to western Clare. There are high plateaus south of the Shannon, and Kerry seems a mass of mountain-ridges running out to the Atlantic. From Bantry Bay to Waterford high ranges shut out the interior of the country, and then we again come in sight of the south end of the Leinster Chain.

2. The great lowland, the Central Plain of Ireland, is worn out of an old grey limestone, and seldom rises 400 feet above the sea. But it comes out to the coast at Dublin, Sligo, and Galway, and at these points gives a passage into Ireland. Dublin Bay is finely guarded by two masses of hard rocks, the peninsula of Howth on the north and the granite hills of Killiney on the south. From Killiney south to Carnsore Point the sea is cutting away the shore, and broad gentle curves mark the coastline. Even the great front of Bray Head, formed of slates and quartzites like those of Howth, is attacked and undermined by the waves. Wexford Harbour is due to the growth of a long bank of mud and sand across the mouth of the River Slaney, leaving a small passage to the port. The granite of Carnsore makes a sort of resisting cornerstone at the south-east point of Ireland.

3. The harbours of Waterford, Cork, and Kinsale on the south coast are clearly due to submergence of the land. The rivers had carved out valleys here before the Ice-age, and the sinking of the country allowed the sea to penetrate far inland. The

passage to the east of the island on which Queenstown stands is thus due to the Owenacurra, while that to the west represents part of the valley of the Lee. Such inlets have been well called *drowned valleys* (p 11) The winding water at Kinsale affords protection for the fishing fleet on a very stormy coast The west of Munster shows a number of promontories of hard Old Red Sandstone and slate, with softer rocks, mostly limestone, running nearly east and west between them. The rivers in old times wore down their valleys along the bands of softer rocks, and the sinking of the country let the Atlantic into these broad grooves, giving us Dunmanus and Bantry Bays, the Kenmare Estuary, and Dingle Bay. The hillsides here come down steeply to the sea, and the bare rocks show the rounded forms and scratchings that were given to them when glaciers moved across them in the Ice-age. Clear Island, Dursey Island, Valencia Island, and the Blasket group, are parts of the valley-sides which have escaped, as it were, from drowning, while parts farther west have been entirely submerged. The splendid peaks of the Skelligs off Waterville, cut into and sharpened by the Atlantic waves, form a striking picture of the lost land in the west of Ireland.

4 The sinking of Ireland has let the tidal waters up to Limerick, 55 miles from the open sea. It has flooded a low part of the limestone plain at Galway, leaving some of the higher layers of rock

still standing up as the barren shelves of the Aran Islands, 30 miles from the head of the broad bay. The islets and sounds of Connemara all point to a sunken coast, and Killary Harbour, ten miles long and in places only a quarter of a mile wide, is the lower part of the narrow Erriff Valley, scoured and no doubt deepened in old days by a glacier moving down it. It is the best representative in Ireland of the long sea-inlets known as fiords in Norway.

5 Clew Bay, like Galway Bay, is a submerged hollow of low-lying limestone, and its "hundred islands" are drumlins (p. 29), which were left at its head by a great ice-sheet, and which are now being cut into by the sea. Similar drumlins make very hummocky country on the land near Newport, which so far has escaped submergence. The sea-inlets to the north resemble those of Connemara, and Blacksod Bay, behind a huge barrier of crystalline rock, provides unexpected shelter from the Atlantic gales. The stream that cut out the sunken Blacksod valley must have risen on land which is now entirely lost to us in the north. The straight edge of the north of Mayo, and that of the south of Connemara, are probably crack-lines along which great masses of rock have sunk away.

6. The Donegal coast, again, especially at Mulroy Bay and Lough Swilly, shows how the sea has entered the valleys of an older and a larger Ireland. Lough Foyle has been narrowed at its mouth by a slight uplift, causing a raised beach (p. 11), on which the wind has piled up ridges

of blown sand. From Portrush round to Larne the waves are cutting at the rocks, and the soft beds of clay on the Antrim coast allow the white limestone and the heavy basaltic rock above it to slip seaward, frequently breaking up the coast-road.

7. Belfast lies at the head of the drowned portion of the valley of the Lagan, and the precipitous hillsides on the north-west, and the hard slates and sandstones of County Down on the south-east, make good boundaries for this noble port. The curious straggling inlet of Strangford Lough is merely a piece of the hummocky land of Down flooded by sea-water.

8. Carlingford Lough is a fiord, like Killary Harbour, and runs up towards Newry between romantic hills. The smooth granite domes of Slieve Donard and of the other Mourne Mountains on the north side of the inlet form a remarkable contrast with the dark and rugged crest of Carlingford Mountain on the south, which is formed from a more splintery and resisting igneous rock.

9. From Dundalk to Dublin the coast is much like that from Dublin southwards. The rocks are limestones and shales for the most part, and have been cut back uniformly by the sea. But the sea reached them in the first place as the result of the general sinking of the edge of Europe, whereby the Irish Channel was formed out of a wide valley, while the Atlantic depths were brought within fifty miles of the Mayo shore.

10. It is interesting to remember that the early inhabitants of Ireland handed down traditions of Brasil, the Isle of the Blest, an island seen against the sunset, and now lost from human gaze. It is quite possible that land once visible to settlers in the west has disappeared, partly by submergence, partly by the battery of the waves. Sunken beds of peat and forest-trees are found in dredgings round the whole Irish coast, and prove conclusively that the present land owes its shape and limits to earth-movements later than the Ice-age.

CHAPTER IV.

THE STRUCTURE OF IRELAND.

1. *The Mountains.*—Although the sea has covered Ireland at various times, and has laid down successive beds of rock, the weather has been so long at work upon the present surface that the groundwork of the country lies revealed. Even on an ordinary map, two distinct groups of mountain ridges can be traced. One group runs from south-west to north-east (Fig. 12). It includes Slieve Gamph, the “mountain of storms,” from which the rain descends on Swineford and Collooney; the Glendowan and Derryveagh Mountains in Donegal, with the great glen between them; the ridge of granite and slate from Newry to Slieve Croob in the heart of Down; and, most strikingly of all, the great Chain of Leinster, running from Dalkey for seventy miles to the junction of the Barrow and the Nore. The second group runs from west to east, and gives us the Galtee Mountains, Macgillicuddy’s Reeks, the steep heather-covered promontories that jut out into the Atlantic from the west of Kerry, and the Knockmealdown and Comeragh Range, which is cut off steeply by weathering north of Dungarvan.

2. The south-west and north-east group of mountains is made of older rocks than those of the east-and-west group. The ground of Ireland was



FIG. 12.—Map showing direction of Mountain Ranges and principal Rivers in Ireland.

already crumpled before the southern folds were made. Hence we find mountains belonging to the later group which interestingly follow the lines of the older group of hills. North of the Galtee Mountains we have the long upland of Slieve Felim,



FIG. 13.—The Old Red Sandstone range of the Knockmealdown Mountains, from below Mount Melleray.

the Devil's Bit, and Slieve Bloom, stretching from south-west to north-east, but belonging, as we know from its rocks, to the later group of folds. The plateaus of the coalfields of Tipperary and Leinster follow the same general direction as the far older Leinster Chain

INDEX TO FIGURE 14.

(This index and the map may well be coloured by the reader.)



Clays on shore of Lough Neagh.



Basalt of northern Ireland.



White Limestone (Chalk) of northern Ireland.



Red Clays and Sandstones, older than the Chalk and younger than the Carboniferous beds.



Carboniferous Sandstone and Shale, sometimes including coal-seams.



Carboniferous Limestone, mainly forming the central plain-land.



Old Red Sandstone, especially seen in the southern mountain-ranges.



Shale, Slate, and Sandstone older than the Old Red Sandstone.



Altered rocks (Mica-Schist, Gneiss, etc.), mainly seen in the north-west highlands. Schist and Granite of the Leinster Chain.



Igneous rocks with a composition like that of Basalt, but often more crystalline.



Granite and igneous rocks with a similar composition. The G has been omitted in the case of the Leinster Chain.



FIG. 14.—Map showing the Rocks which form Ireland. See index on opposite page. The dotted lines are County-boundaries.

3. The hummocky ground from Longford to the coast of Down is a sort of expansion of the Newry and Slieve Croob range, and belongs to the older group of folds. The same rocks run on across the Channel as the Southern Uplands of Scotland.

4. The later group of upfolds is very largely made of the hard and resisting rock known as the Old Red Sandstone (Fig. 13). The grey limestone of Ireland, known as the Carboniferous Limestone,* once lay across the ridges, and was folded with the Old Red Sandstone under it; but it has been generally washed away from the higher ground, and remains only along the downfolds, in which the Suir and the Blackwater and other rivers run. Frequently, moreover, patches of the older slaty rocks appear in the midst of Old Red Sandstone hills; the underlying floor of Ireland was bent up when these later folds were made, and the removal of the Old Red Sandstone from the tops of the folds allows the slates and shales to be attacked by weathering. These rocks give rise to clay soils, and the farmers thus cultivate basins, as it were, surrounded by barren sandstone hills. Such upland basins may be seen in the Ballyhoura Hills west of Galtymore, at Ninemilehouse in Tipperary, and in many of the domes of sandstone that appear in the great Central Plain.

* "Carboniferous" means "coal-bearing." Beds of coal occur in places above the limestone, and the name has become applied to a whole series of rocks, most of which contain no coal.

5. The Central Plain and Hills left standing above it.—The Central Plain itself consists of Carboniferous Limestone, which has not been lifted sufficiently high to be dissolved by natural

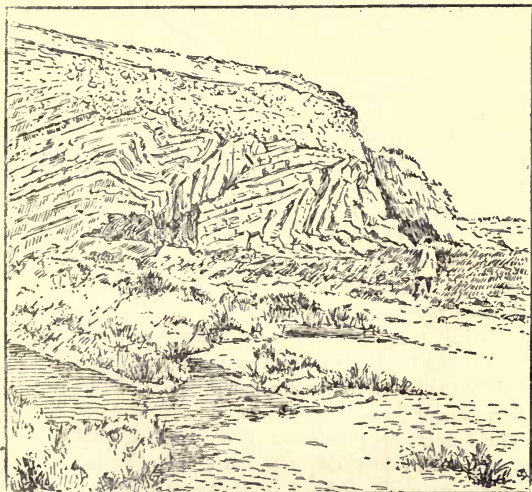


FIG. 15.—Folded Carboniferous Limestone overlain by boulder-clay. Loughshinny, Co. Dublin.

waters and washed away. The rocks have been crumpled, but they have been worn down nearly to a level surface, on which boulder-clay has been deposited during the Ice-age (Fig. 15). For a long time the limestone was protected by later

shales and sandstones, with coal-seams in the higher beds, which remain here and there as patches on its surface. The hills round Lough Allen stand up in this way ; and coal-seams are found on their sides at a height of 1,000 feet above the sea, showing how much coal has been lost by the long-continued weathering of the land. Another very striking mass is the plateau of the Leinster coalfield, lying between the Nore and the Barrow ; it is basin-shaped on its summit, and the highest crests are near its margins, with steep descents into the lowlands round about.

6. Igneous Country of the North-East.—The fine hill of Slieve Gullion, between Dundalk and Newry, and the neighbouring summits of Carlingford and the Mournes, are due to the intrusion of igneous rocks long after both the main systems of folds had crumpled Ireland. They are among the youngest additions to the structure of the country. The high plateaus of Antrim and the east of Londonderry are of the same age as the Mourne Mountains. The country hereabouts was at one time covered by a sea which laid down a pure white limestone known as chalk, formed of immense numbers of tiny shells. Then this white limestone was uplifted, volcanoes broke out, and the region was deluged with the dark lavas called basalt. As these flowed over the surface in a molten state, sheet after sheet covered one another, filling up the hollows, and producing a fairly level plain. Here and there, as at Slemish, the fine steep hill on

which St. Patrick fed his master's sheep, we find relics of the volcanoes from which the molten lavas spread.

7. When, in their turn, the lavas were uplifted, the edges of the plain were bent up on the east and on the west, and the central part was dropped as a broad basin. The River Bann, flowing through this from the Mourne Mountains, flooded the lowland and produced Lough Neagh, the largest sheet of water in our islands.

8. The upturned edges of the basalt were weathered into fine steep crags, facing outwards. and forming grim black cliffs, which rise above Belfast Lough and continue from the Giant's Causeway to Lough Foyle. Except for the hard masses that here and there fill the throats of the old volcanoes, there are no true mountains in this lava-covered country of the north. The highest land occurs along the edge of the great basaltic basin, and from it the ground falls in broad plateaus (Fig. 26) until we reach the level of Lough Neagh.

9. **Contrasts in the Landscape.**—The structure of Ireland, then, provides delightful contrasts in her scenery. The worn-down limestone of the plain lies against far older hills. Even the plain itself has an interest, when we think how it has emerged from a sea that covered nearly all the country. The grey cloudy skies, with the long sun-gleams shining through them, spread away to the horizon, above broad stretches of brown bogland. Here and there a green esker runs

like a wall across the landscape, and reminds us of the colder times when the lowland was covered with sheets of ice. In Cavan and Monaghan the hummocks of the drumlins rise a hundred feet or more out of the plain, and the streams have to find a way between them, while the hollows are set with gleaming lakes. On the edge of the country we find the mountains, and from them, to north or south or east or west, we look out to the great horizon of the sea.

10. **The Breaking in of the Atlantic.**—As we have said, Ireland was not always an island. The west coast cuts right across the east-and-west group of earth-folds, and the North Atlantic has been produced by the sinking of old land. When we examine the map, we are struck by the straight line of the north edge of Mayo, and by the parallel line of the south coast of County Galway. The latter line is continued by the low ground from Galway town away to the east coast at Dublin Bay. These look very like earth-cracks ; and the edge of Ireland has no doubt been shaped, as we said in Chapter III., by the dropping of parts of the older country beneath the sea.

CHAPTER V.

THE RIVERS OF IRELAND.

1. When a country is lifted above the sea, as a plateau or as a mass of folded hills, the weather works away at it, the water gathers along certain weaker places, and streams run on its surface in valleys which become deeper as time goes on. The rivers in a large part of Ireland run southward. The land at one time must have had a southward slope, when many of the mountains that now stand out on it were hidden away under rocks of younger age. The rivers carved out long valleys, but at the same time removed the younger rocks. Helped by the smaller streams that ran into them, they widened their valleys to such an extent in the limestone plain that it is now difficult to see the division between one valley and the next. Since the waters can dissolve the limestone, the rivers often spread out on it as lakes, which are merely flooded portions of the plain. Lough Corrib stretches away from Oughterard like a sea, with little flat-topped islands in it, but, where it runs back into the mountains of old crystalline rock, it has steep walls and quite a gloomy aspect. Similarly, the rivers have steep-sided valleys where they cross the folded ranges, like the Shannon at Killaloe or the Blackwater from Cappoquin to

Youghal. These rivers once ran on land that was higher than the present summits of the ranges. They cut down through this land, and found, as it were, the ribs of an older Ireland underneath. They cut slowly into these ribs, removing the soft rocks between these obstacles at the same time. The result now is that the rivers run through the mountain-ranges, as if they had climbed across them, and had worked out their valleys like a saw. As a matter of fact, the rivers made these valleys when their heads and the upper parts of their courses lay on rocks that have been entirely washed away (Fig. 12).

2. While the old mountain-bars, the ribs of Ireland, were appearing from beneath the younger rocks, they stood up more and more above the general surface, and gave rise to rivers of their own. Numerous streams thus flow down from both sides of the Leinster Chain, while streams run north from the Galtees into the Vale of Aherlow, and south on Clogheen to form the Tar. The streams from the northern slope of the Slieve Bloom Mountains fall into the Shannon, while those from the southern slope reach Waterford Harbour by the Nore.

3. The drowned valley of Cork Harbour and that of the Blackwater below Cappoquin are parts of the old system of rivers that ran from north to south.* The carving out of valleys by their tributaries along the bands of limestone in the

* This was first pointed out by J. B. Jukes when he was marking out the rocks on maps for the Geological Survey.

downfolds of the southern ranges has, however, cut up and destroyed the surface over which their upper portions originally ran. The best remaining examples of the north-and-south rivers are the Shannon, the Nore, the Barrow, and the Slaney.

4. **The Shannon.**—The Shannon rises in the water condensed on the high moors of Cuilcagh, nearly 2,000 feet above the sea, and drops 1,800 feet to Lough Allen, among gloomy hills. When it runs out of the lake, it wanders among drumlins away into the limestone plain. There is now nothing to check it. Formerly it must have run in a great valley between walls of shale and sandstone; these rocks have been worn away, and only the underlying limestone floor remains. In its long course southwards, it is often difficult to distinguish the river from the lakes. The water of **Lough Gara** and **Lough Key** joins it in a broad stream above **Carrick-on-Shannon**, and it soon widens out as **Lough Boderg** and **Lough Bofin**. Near **Roscommon** town the Shannon becomes known as **Lough Ree**, which sends up a broad branch, also on grey limestone, to the north-east. This branch is in reality the flooded valley of the **Inny**, coming down from the watershed of slaty rocks in central **Cavan**, and broadening out as **Lough Sheelin** and **Lough Derravaragh** on the way. The fine wide water of **Lough Ree** sends the Shannon on its course as a noble river at **Athlone**.

5 Then comes a winding stretch down to **Portumna**, with frequent grassy islands (Fig 18.) The

Suck, which rises far north near Castlereagh, and runs down parallel with the Shannon, comes in above Banagher, and adds a great flow of water from the plains of Galway. The Shannon valley at Portumna, between Slieve Aughty and Slieve Bloom, has a width of forty miles. In **Lough Derg** we find the remains of the older and narrower valley, for the river has not been able to sweep away the Old Red Sandstone and slate on either side. At Killaloe there is a picturesque passage through the hills. The drop to Limerick is fairly steep, producing the foaming rapids of Castleconnell, which prevent the steamers that run from Banagher from coming farther south than Killaloe. At Limerick we reach the drowned part of the valley, where the dropping of the west coast of Ireland has let the Atlantic run for fifty-five miles up into the land. The grain-ships from South America can thus be berthed at the city quays. The Norsemen in old days found in these quiet waters something like the long sea-inlets of the Atlantic coast of Norway.

6. **The Nore.**—The head-waters of the Nore lie in Slieve Bloom and in the north end of the Devil's Bit range. Thence the river follows the old southward slope of the country, and it has cut through the sandstones and shales of the Leinster coalfield, separating the coal-bearing beds of Slieve Ardagh from those of Castlecomer. Below Thomastown it runs in a narrower valley in the hard Old Red Sandstone and the older shales, and at New Ross

the Barrow joins it at the head of a long inlet of the sea.

7. **The Barrow.**—The Barrow starts at the north-east end of Slieve Bloom, runs eastward to Monasterevan, and is there joined by the **Figile** and the **Slate Rivers**, coming down from the great bogland to the north. The Figile and that part of the Barrow which lies below Monasterevan form in reality the main southward-running stream, and this has cut its way down to the limestone between the Leinster coalfield and the Leinster Chain. It runs below Goresbridge right across the granite of the chain; with the moorland of Blackstairs Mountain rising high upon the east, and Brandon Hill, 1,500 feet above the stream, upon the west. New Ross has been built at the head of the long sea-inlet that now represents the valley of the united Nore and Barrow. The channel of Waterford Harbour, widening out southward, was thus originally due to the cutting power of the rivers coming down from central Ireland.

8. **The Slaney.**—The Slaney rises on the slates and shales on the west side of the Leinster Chain, but evidently it once was much longer and came from ground now worn away. It cuts boldly into the granite, like the Barrow, making a passage in which the mountain-town of Tullow lies. At Newtownbarry it is out on the slates and shales of the east flank of the chain, and has made a pleasant valley, partly under rocky cliffs, to join the sea at Wexford.

9. **The Suir.**—This river is a long tributary of the Nore and Barrow valley, which it joins in the sea-inlet east of Waterford. Sea-going steamers come into Waterford, and lie close against the houses at the quay. The Suir stretches back in a beautiful valley, which has been carved out along a downfold of the Carboniferous Limestone (p. 44), and its head-waters come down from the great plain near Templemore. For the first forty miles of its course it is thus one of the southward-running streams, and at one time, before the plain was worn down and lowered, it may have escaped over the Knockmealdown region to the sea. The **Tar** and the **Aherlow**, on the south and the north side of the Galtee range, show how the streams have found their easiest courses along the limestone downfolds, leaving high ridges of the Old Red Sandstone between their valleys.

10. **The Blackwater.**—There are several rivers bearing this name in Ireland ; but the largest is that which rises in the upland a few miles east of Killarney, and runs eastward to Cappoquin. At Millstreet it gets into a narrow limestone downfold, and follows this through Fermoy and Lismore. The towns have been planted close above the stream, on wooded banks which rise steeply towards sandstone moors. At Cappoquin we find that all this long stretch of river is really a tributary of one of the old southward-running series. The stream turns suddenly to the south in a picturesque and narrow valley carved right across the earth-folds.

The **Bride** comes in, running from the west along its own special downfold ; and the lower reach of the Blackwater valley is now drowned, so as to admit the sea from Youghal to Cappoquin.

11. **The Lee.**—The head-waters of the Lee, rising in the far west of Cork, not far from Bantry Bay, have long ago washed away the covering of Carboniferous Limestone, and the river flows eastward over Old Red Sandstone moors to Crookstown. The romantic little lake of Gouganebarra, overshadowed by steep rocks, and the more open lakes of Inchigeelagh, form part of its upper waters. Below Crookstown, however, it gets into one of the ordinary limestone downfolds, and its lower part, drowned by submergence, forms the fine harbours of Cork and Queenstown. The coach-road from Bantry to Cork gets into the Lee valley near its head by the narrow pass of Keimaneigh and follows it throughout its length. The railway has chosen the same convenient hollow up to Macroom.

12. **The Bandon.**—The Bandon has the same history as the Blackwater and the Lee. The main part of the stream is a long westward-stretching tributary, and the short lower reach, entered by the sea, is part of an old southward-running stream. In this case the drowned valley gives rise to the winding and steep-sided harbour of Kinsale.

13. **The Liffey.**—The Liffey, and its very important tributary, the **King's River**, run north-westward from the high moor of the Leinster Chain, and perhaps once escaped in the same direction into

the plain. At present, however, the water is drawn off southward along the freshly-cut gorge of Pollaphuca, south of Blessington, where the torrent is still working its way down among the slaty rocks. When it reaches the limestone plain, the river wanders along the edge of the Bog of Allen, and finally reaches Dublin Bay. At Leixlip (the Norsemen's name for the "Salmon Leap"), it falls over steps of limestone, and below Lucan it has cut its present channel deeply down into the boulder-clay of the Ice-age. The **Dodder** rises near the Liffey, on the other side of Kippure, and flows north-west and then north, so as to fall into the Liffey at Dublin. The two streams thus have very different lengths.

14. **The Bann.**—There is a River Bann (p. 76) which runs in Wexford parallel with the Leinster granite, and which forms a tributary of the Slaney. The larger River Bann lies, however, in the north, and runs off the granite domes of the Mourne Mountains into the great basin of **Lough Neagh**. Banbridge, on the old Newry and Belfast road, is named from it, and Portadown has grown up on its banks in almost level land. The river flows out of Lough Neagh at Toome Bridge, which is noted for its eel-fisheries, and forms a smaller lake, appropriately named **Lough Beg**, amid grassy meadows; it then continues northward in a broad valley to the sea below Coleraine.

15. **The Erne.**—The head of the Erne lies in the county of Longford, where it runs northward

from the low ridge of slaty rocks, just as its near neighbour, the Inny, flows southward as part of the Shannon system. Directly it reaches the limestone, which here remains on the north slope of the slates, it widens out as **Lough Gowna**, and then makes a tangle of branching and winding water-ways, known as **Lough Oughter** and **Upper Lough Erne**. Numerous drumlins (p. 29) were here dumped down on the country as the last glaciers melted away, and these mounds have often blocked the old courses of the rivers, and have sent them off in curves between the rounded hills. **Belturbet** is built on the Erne, south of **Upper Lough Erne**, and **Enniskillen** occupies a similar position above **Lower Lough Erne**, one of the finest lakes in Ireland. The Carboniferous rocks form a steep slope, crowned by cliffs, along the south side of this lake, reaching up towards the still higher hills in which the Shannon rises. At its outlet from the lake, the Erne meets the old crystalline rocks that stretch down from **Donegal**. It runs in fine rapids through a little gorge at **Belleek**, drops over a fall at **Ballyshannon**, and so enters **Donegal Bay**. These rapids and falls at the end of the stream, like those at **Leixlip** near **Dublin**, at **Ballysadare** near **Sligo**, and at **Castleconnell** on the **Shannon**, are due to a general uplift of the country, which gives the rivers fresh work to do in cutting down their valleys to the level of the sea.

16. Many other rivers, like that in the wooded Ovoca valley (p. 72), or the Moy (p. 104), which runs parallel with Slieve Gamph and then cuts across the south end of the range, deserve description as among the most interesting features of the Irish surface. Some are very old ; others are evidently quite young and not yet certain about their courses. It seems to matter little whether water finds its way from the bogs of the great central lowland to one side of Ireland or the other. The Shannon makes a line of division between east and west, and it is probably drawing more and more water into itself as it lowers its valley by solution of the limestone floor.

17. Man, wherever he lives, wants water. Though in old times he had to protect himself from his neighbours by building castles upon hills, he placed his settlements by choice upon the banks of streams. The stream-cut valleys provide, moreover, the easiest ways along a country, and the great roads in many parts of Ireland have grown up from the trampled riverside tracks along which prehistoric peoples moved.

CHAPTER VI.

LEINSTER.

1. The four provinces into which Ireland is now divided are Leinster, Munster, Connaught, and Ulster. Each is subdivided into counties. Leinster is the south-east province, and includes the counties of Louth, Longford, Westmeath, Meath, Dublin, King's County, Queen's County, Kildare, Wicklow, Kilkenny, Carlow, and Wexford.

2. Leinster contains two features due to the earlier series of earth-folds. The tumbled country formed of shales and sandstones that runs north-east into the Southern Uplands of Scotland begins to show through the Carboniferous Limestone near the town of Longford, and forms the greater part of Louth. A large patch of limestone, with coal-bearing beds on the hill above, remains in the west of Louth and the north of Meath, showing how these strata once covered all the region. A far more striking feature is formed by the great folded range extending from Dublin Bay to Waterford Harbour, in the heart of which the Leinster granite rose. This is like a backbone to the province, and receives the rains from the moist air that blows across the plain, and also those from the south-east storms that so often beat up from Arklow. The domes of the granite, rising to over 3,000 feet in Lugnaquilla, are in consequence

covered with heather and mountain-bog, and the general dampness feeds streams that flow down pleasantly on both sides of the chain. During the Ice-age, glaciers occupied the highland, and broad hollows were worn out in the granite hills.



FIG. 16.—Moraine and cirque of Lough Nahanagan, Co. Wicklow.

The streams now gather in these hollows ; but here and there, as at the two Loughs Bray and Lough Nahanagan in County Wicklow (Fig. 16), a great barrier of stones marks the place where a glacier shot

its burden over its melting front and so built up a semicircular wall. Lakes have now formed behind these moraine-barriers, in steep-sided semicircular hollows eaten out by frost in the hillsides. Such hollows are known as cirques, and form a characteristic feature of both sides of the Leinster Chain. Many of them, like that above Tiknock in County Dublin, have become partly smoothed down and grass-grown.

3. The stratified slates and sandstones on the flanks of the great chain are cut into more easily by the streams, which here form narrow valleys, in the floors of which the water hurries along in foaming rapids among the stones. As was pointed out in Chapter V. some of the water from the west side of the range is carried right through it and down to Wexford by the Slaney.

4. The drainage of Leinster on the whole runs from north to south through the two great valleys of the Barrow and the Nore. The high plateau of the Leinster coalfield lies between them, a mere relic of the beds that once overlay the limestone and were continuous with those already mentioned in Meath and Louth. In Queen's County the bulge of the Slieve Bloom Mountains comes up through the plain-land ; but the interior of Leinster consists almost entirely of limestone. This has been worn down to an almost level surface, on which boulder-clay was deposited by the melting ice, and above which gravelly eskers rise as winding mounds. Bogs are frequent in the north of

Leinster, and the great Bog of Allen occupies a waterlogged lowland stretching westward from Edenderry and Kildare away to the basin of the Shannon.

5. The great feature of the county of **LOUTH** is the igneous ridge of Carlingford Mountain, mostly formed of a tough black rock like a coarsely crystalline basalt (p. 9). This makes a bold rugged mass above the picturesque town of Carlingford, where Norman castles once held the entry to the lough. From Greenore, a little to the east, mail-steamers run to Holyhead, and the little town is like a colony of the English London and North Western Railway, which has made the line into Dundalk. Dundalk has a port and a busy agricultural market, and is an important halting-place for trains that cross the moorland to the north.

6. Drogheda, on the Boyne, is the city of the "bridge-ford." As P. W. Joyce points out, the river was forded here on the great track northward, and in later times a bridge was built over the ford. There is a steep drop on both sides to the bridge, and the town is clustered along the narrow valley, both on the Louth and Meath banks of the Boyne. The view from the railway-viaduct of its church-spires, ancient gateways, and the steamers and shipping at the quays, is the most picturesque feature on the line from Dublin to Dundalk. To the north rises the round tower of **Monasterboice**, a famous abbey of the fifth century, which

preserves the name of its founder, St. Boetius, who was born in County Louth.

7. The north of the county of **LONGFORD** is slaty, and drains into the Erne ; but the main part of the county lies in the central plain. **Longford** town lies in a pleasant country on the Camlin River, which runs gently westward to the Shannon. The main railway-route to Sligo goes through it ; but the county as a whole is removed from important lines of traffic.

8. **WESTMEATH** centres in Mullingar, where the railway divides for Sligo and Galway. It is a limestone land in which numerous lakes have gathered, and in the south-west it is bordered by the Shannon and Lough Ree. The fine town of **Athlone**, "the ford of Luan," commands the bridge across the Shannon, which was first built by Sir Henry Sydney in 1566 to carry the road from the Irish Sea to the Atlantic.

9. **MEATH** includes **Tara Hill**, the old seat of Irish government, looking out across the plain. It is still crowned by a great earth-ring ; but the High King's palace and the city are overgrown by grass. The Boyne flows through the county from its south-west corner to the sea below Drogheda. **Trim**, with a grand Norman castle, and **Navan** have grown up on it. The road from Dublin to Enniskillen goes through Navan. The valley of the Boyne below Navan has wooded banks, which rise steeply on the north at Slane. On the conspicuous Hill of Slane, where hard

igneous rocks lie among the shales, St. Patrick kindled his memorable Easter fire in 433, the light of which shone across to Tara Hill. Between Slane and Drogheda the great burial mounds of New Grange, Knowth, and Dowth indicate the importance of the district some three thousand five hundred years ago.

10. Kells, in the north-west of Meath, is famous for the well-preserved stone oratory and dwelling known as St. Columba's House. It was a strong town in Norman times.

11. The large extent of grass-land on the clayey soils of County Meath and the nearness of the port of Dublin have made it one of the best-known grazing districts in Ireland.

12. The county of **DUBLIN** is small, but has great historic importance, since it has been marked out to include the country round about Dublin Bay. This bay is the most convenient inlet on what may be called the European side of Ireland. The central plain here comes down to the coast, and the Liffey valley affords an easy entrance to the interior. The bay is sheltered on the north by the rocky mass of Howth, which is joined by a raised beach to the mainland, and on the south by the granite of Dalkey, which rises at Killiney 512 feet above the sea. The Dublin Mountains are a northern part of the Leinster Chain, and were included in the county when a division was made between it and Wicklow in the reign of James I.

13. Hence the north of County Dublin is fairly level, and is covered with clays containing scratched stones deposited as the ice melted away. Here and there knobs of the limestone floor form small hills, and are quarried for lime, as at Feltrim Hill and St. Doolagh's. The same sort of country extends south of the Liffey until the slate and granite land is reached. The hillsides then rise steeply, and the ice has banked great mounds of clayey gravel against them, in which the descending streams cut deep and narrow valleys. The green and cultivated surfaces of these mounds of boulder-clay and gravel call attention to them as one looks down from the mountains, where furze and finally heather cover thin and peaty soils.

14. The county-boundary passes through the summit of Kippure, 2,473 feet above the sea, so as to include the head-waters of the Dodder; a reservoir has been made in Glenasmole, allowing these waters from the moorland to be used in southern suburbs of Dublin. Glencullen is a wild valley, carved out by a stream running east to Bray, and it still retains the character of the glens, traversed only by foot-tracks, which so long provided a shelter for tribes hostile to the dwellers in the central plain. Until the marking out of the county-boundary, the people who settled in the rich lowland of Dublin had nothing in common with the people of the hills. The O'Byrnes and O'Tooles descended from time to time down the steep slopes of Slieve Roe (Three Rock Mountain)

(Fig. 17), and fought with the Norsemen, the Normans, or the colonists from Bristol, who successively held the country round the bay. The Dublin district was often occupied by strangers, and was a Scandinavian kingdom from the ninth to the twelfth centuries. The great battle fought at

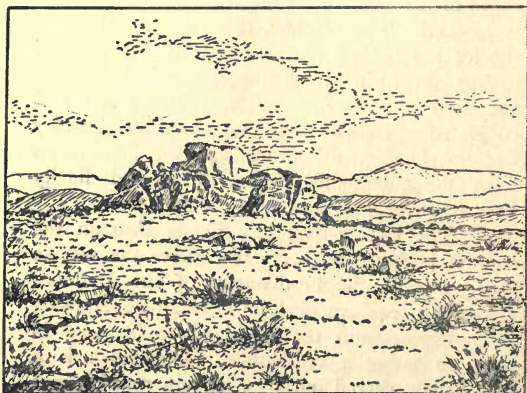


FIG. 17.—Granite on Three Rock Mountain, looking towards Bray Head and the Great Sugarloaf.

Clontarf in 1014, on the north bank of the Liffey estuary, broke the power of the Norsemen, but left them in possession of the port of Dublin.

15. The sea-rovers, indeed, founded the prosperity of Dublin, as they did that of many Irish coast-towns. Till their arrival, Dublin was a village of fishermen at "the ford of the hurdles,"

where the Liffey could be passed by those who went from the raths on the south, Rathmines, Rathfarnham, and the rest, to St. Columba's monastery of Swords (Sord Columkille) or the antique settlements on the Boyne. Old Dublin was built on the south bank of the Liffey, and the woods lay thickly between it and the heather-clad hills. Ships came and went from its quays in Danish times, and its people probably knew more about what was happening in Europe than they did about the affairs of the Irish in the central plain. The later city has spread on the north bank also, and on the south red-brick suburbs have occupied Cullenswood and Rathmines. The great platform of boulder-clay which the ice left behind across the district has been cut into by the Liffey and the Dodder ; but it still forms level ground under a large part of the suburbs. Phoenix Park, two miles across from east to west, lies on this platform, and the " fair waters " from which its name is derived break out as springs on the bank that descends steeply to the Liffey.

16. The Norman castles at Dalkey, Howth, Malahide, and Portrane show the importance of holding the inlets on the Dublin coast for any power that sought to govern Ireland. Dublin to this day is the centre of government and professional life of all kinds. It includes among its educational institutions Trinity College (Dublin University), a University College of the National University, and the Royal College of Science for Ireland. It

is still the eastern gate of Ireland. The old sailing packets with the mails used to shelter inside Dalkey Island; the great cross-channel steamers from Holyhead now come into the dredged and walled mouth of the Liffey, right up to the quays of Dublin, or into the fine harbour constructed at **Kingstown** in the first half of the nineteenth century. Passengers and mails are conveyed by rail from Kingstown into Dublin, and every morning trains are run through from Kingstown pier to Belfast, Cork, and Galway, almost along the routes of the old high roads. The distance from Kingstown to Holyhead in Wales is only 57 miles.

17. Dublin, with its suburbs stretching down to Kingstown, is practically the only town in the county. **Howth**, **Malahide**, and **Skerries** are fishing villages, which have grown to be seaside resorts. **Balbriggan** has a hosiery industry which has rendered its name well known.

18. **KING'S COUNTY**, which was marked out, with Queen's County, in the reign of Philip and Mary, has its origin recorded in **Philipstown**, which is now little more than a large village. The country is typical plain-land, with numerous broad bogs, and here and there eskers rising like great walls above the level ground. **Croghan Hill**, near Philipstown, is the neck of an old volcano, which broke out when the limestone was being laid down. The Old Red Sandstone of the **Slieve Bloom Mountains** forms a bold borderland

in the south. Banagher in the west has a port on the broad waters of the Shannon. Some fifteen miles upstream, on the green bank, stand the ruins of Clonmacnoise, one of the most famous centres

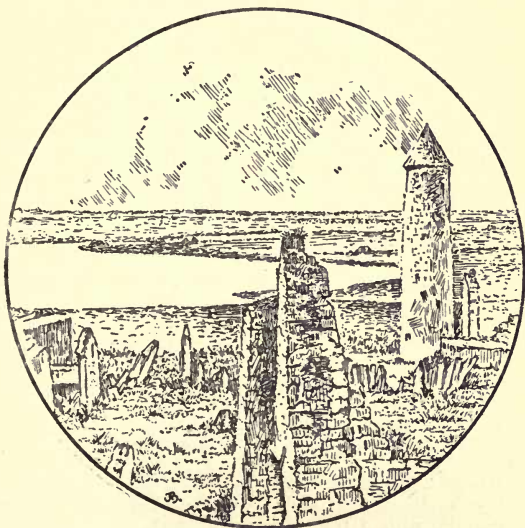


FIG. 18.—The Shannon at Clonmacnoise.

of learning in mediæval Ireland. Birr, with a fine castle and the observatory of Lord Rosse, lies on the Little Brosna River, a tributary of the Shannon; but the east side of the county drains

into the Barrow system. Tullamore, the largest town, lies almost in the centre of the limestone plain of Ireland.

19. **QUEEN'S COUNTY** includes in the west the greater part of the Slieve Bloom Mountains, which form a broad conspicuous dome above the plain. In the limestone region, bogs are not so abundant as in King's County, and patches of heath and firwood occur on gravel land near Maryborough. This small town is on the main road and railway-line from Dublin to Cork. Portarlinton, farther north, has a junction-station for Athlone. The southern boundary of the county climbs up to the Leinster coalfield, and the River Barrow is conveniently chosen for a large part of the eastern border. The ancient stronghold of the **Rock of Dunamase**, now crowned by a Norman castle, stands above the road from Maryborough to Stradbally.

20. **KILDARE** presents much variety of scenery. A small ridge of old slaty and volcanic rocks, forming the Chair of Kildare and Dunmurry Hill, rises above the limestone plain north of Kildare town. In this town is an ancient cathedral, now rebuilt, with a round tower near it, crowned by battlements. The branch railway starts hence for Carlow, following the valley of the Barrow. Between Kildare and Newbridge stretches a gravel plateau, the Curragh, used for a military camp. At Naas, farther north-east on the Dublin road, a branch-railway goes south to Tullow in the

Leinster Chain, and the road diverges for Carlow and Kilkenny. At Maynooth, close behind the ancient castle, is a well known ecclesiastical college. The north-west of the county is a continuation of the bogland of King's County, and the Liffey wanders on the border of this level country. But the south-east of Kildare includes the slaty hills on the margin of the Leinster granite, and the Liffey here comes down from Ballymore Eustace as a true river of the mountains. Athy has arisen at "Ae's ford," on the Barrow, and Norman castles defend the passage of the stream. Castledermot contains a round tower and fine sculptured crosses.

21. The county of **WICKLOW** includes the highest and most romantic portions of the Leinster Chain. From Bray to Shillelagh it is essentially a land of hills. Its people were for long typical "Leinstermen," with their hands against the plainmen to the north and west, as well as against invading strangers from the sea. The foothills that flank the central granite, including the quartzite cones of the Great Sugarloaf (Fig. 17) and the Little Sugarloaf, the saw-like crest of Carrick Mountain, and the ridge between Rathdrum and the coast, are difficult enough to traverse. The streams from the main chain have carved out narrow valleys in the resisting slates and quartzites. The Devil's Glen, cut by the Vartry on the steep slope descending to Rathnew, is a grand ravine with vertical rock-walls. The Avonmore from Glendalough and the Avonbeg

from Glenmalure (Fig. 19) unite in the "meeting of the waters" below Rathdrum to form the Ovoca River, which runs foaming down to Arklow between cliffs and wooded banks.

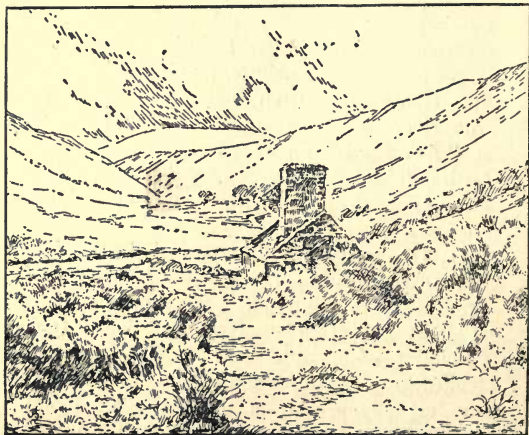


FIG. 19.—Glenmalure, Co. Wicklow.

22. The main road through the mountains is the Military Road from Dublin, which was constructed so as to command the glens after the insurrection of 1798. It enters County Wicklow on the moorland above Glenasmole, and keeps at a high level past the source of the Liffey to Glenmacnass, which it descends to

Laragh. It then climbs over a high shoulder to Drumgoff, at the mouth of the narrowest part of Glenmalure, and goes across another pass to Aghavannagh ; from this point there are roads southward and westward, though the country does not offer easy travelling. The one great road across the granite chain ascends the Avonmore from Rathdrum, climbs into the wild valley of Glendasan, crosses Wicklow Gap at 1,569 feet above the sea, and so gets over into the broad basin of the King's River on the west.

23. The great beauty of County Wicklow lies in the wooded valleys in the stratified rocks that flank the chain. Glendalough, or the **Seven Churches**, is placed on a heap of sand and boulders brought down by glaciers from the granite hills. A lake has formed behind this barrier, and another lies farther up, in a groove carved out of mica-schist. The valley is closed beyond by the granite of the central range. No wonder that St. Kevin in the 6th century found here a solitude for prayer ; but the valley became populous when he established in it the monastery and school of Glendalough. The round tower, rising against the hills, still calls attention to his oratory and the churches round it, a group of grey stone buildings on the green slopes of the moraine.

24. In a valley coming down to the Ovoca at Woodenbridge, considerable quantities of gold have been found, washed from the rocks of Croghan Kinshelagh, and it is probable that the

gold which was so largely used in Ireland for ornaments in prehistoric times came from this part of County Wicklow.

25. The towns of the eastern foothills are **Bray**, a favourite watering-place at the north end of the great cliff of **Bray Head** ; **Wicklow**, where **St. Patrick** landed on his mission, facing the **Murrough** of **Wicklow**, a marshy lowland formed by the mud and sand brought down by rivers from the hills ; **Rathdrum**, strongly placed on a rocky spur above the **Avonmore** ; and **Arklow**, where the **Ovoca** meets the sea. At **Roundwood**, on the **Military Road**, the water of the **Vartry River** has been collected in a great reservoir, from which it is led off as a pure supply for **Dublin**. The overflow still forms a romantic stream in the **Devil's Glen** and the valley of **Rathnew**.

26. **Shillelagh**, famous for its ancient oak-woods, lies close against the granite edge, where a road crosses fairly easily to the **Slaney vale** at **Tullow**. **Baltinglass** and **Blessington** lie in the western foothills, and a light railway runs from the latter town by the side of the road to **Dublin**, taking advantage of a valley cut out along the direction of the earth-folds.

27. Man has thus been forced in **Co. Wicklow** to follow the lines of the ancient crumpling of **Ireland**. The towns are arranged from north-east to south-west down either side of a barren and inhospitable chain, and the **Military Road** keeps in the same direction, as near as it can to the junction of the granite and the shales.

28. The county of **KILKENNY** spreads on either side of the Nore. In the north it includes a large part of the Leinster coalfield, a high plateau avoided by the railways. The Dinin River forms a valley leading up into the coalfield from Kilkenny town. The coalfield is continued on the west side of the Nore on the upland of Tullaroan. In the south of the county we meet one of the east-and-west ridges, from which streams run north into the Nore and south into the Suir near Waterford. The central part of the county belongs to the limestone lowland; but at Thomastown the Nore cuts into Old Red Sandstone, and the scenery is charming through Inistioge down to New Ross.

29. The county centres in the fine old town of **Kilkenny**, where the great castle of the Ormondes holds the bridge across the Nore. St. Kenny or Canice probably founded a church here in the 6th century; the town and the present cathedral, standing high on the west bank of the river, preserve his name. The Carboniferous Limestone yields a handsome black marble, with white shells in it, near the town.

30. **Castlecomer** is the only town on the coalfield, with slopes rising from it towards the edge of the basin-shaped plateau. From the old town of **Callan**, south-west of Kilkenny, a road climbs over the upland of Slievenaman to Carrick and Clonmel. The beautiful remains of Jerpoint Abbey lie in the Nore valley near **Thomastown**.

31. The southern boundary of the county is formed by the broad waters of the Suir, and it is noteworthy that Waterford North Station, now one of the most important in the south of Ireland, lies in the county of Kilkenny. The pebbly Old Red Sandstone, with older uptilted slates beneath it, here forms a cliff descending to the river (see p. 8).

32. **CARLOW** is a somewhat small county, most of which lies on granite on the west flank of the Leinster Chain. The Barrow keeps to the more yielding limestone, on the east side of the high coalfield. The Slaney passes through the east of the county ; the town of Tullow lies on its bank. The valley cut by the Slaney affords a low and easy passage into Wexford. The south-east border of the county is elsewhere formed by forbidding hills, among which the dome of Mount Leinster reaches 2,610 feet above the sea. Carlow town dominates a bridge across the Barrow, carrying one of the roads from Dublin to Kilkenny. Bagenalstown and the charming village of Borris lie near the east bank of the Barrow.

33. The north part of the county of **WEXFORD** includes a ridge of slates and hard igneous rocks parallel with the Leinster Chain, and the River Bann runs down from this, and follows the general structure of the country to join the Slaney below Ferns. A relic of Carboniferous Limestone remains north and south of Wexford Harbour, covered by boulder-clay and shelly gravels ; but the country

as a whole has clay-soils derived from the older shales and slates. The bands of igneous rock, folded with the shales in a general north-east direction, provide good material for roads, and produce small hills from Waterford Harbour up to Arklow. The north-west border keeps on the whole to this tumbled lower ground, but runs up on to the granite at Mount Leinster and Blackstairs Mountain.

34. The roads and the railway from Dublin have to follow the general north-east and south-west arrangement of the old earth-folds, much as they do in County Wicklow farther north. **Newtownbarry**, however, is a prettily placed frontier town on the cross route excavated by the Slaney. **Gorey**, **Ferns** (one of the earliest bishoprics in Ireland), and **Enniscorthy**, all lie on the natural route from the north-east to the Slaney inlet. **Wexford** was founded by the Norsemen, at the head of a harbour which is nearly closed by a long sandbank. It still preserves the narrow streets of a town that grew up within fortress walls. In the 12th century it was captured by the first band of Normans who invaded Ireland. The great barrier of granite cuts off the whole county from the rest of Ireland, and accounts for much of the hostility of the men of Leinster to those in the fertile plain-lands of the interior, and for much of the misunderstanding which marked on both sides the insurrection of 1798.

35. While the railway-route from Wexford to

Dublin is one of the most beautiful in the country, the main line of communication now lies south of the town, connecting Cork with London through the harbour of Rosslare. The passage from Rosslare to Fishguard in Pembrokeshire measures only 62 miles.

36. **New Ross** owes its importance to its position below the junction of the Barrow and the Nore, at the head of a long tidal estuary. The Norman invaders, soon after their arrival, fortified it as a stronghold against the west.

CHAPTER VII.

MUNSTER.

1. Munster is, on the whole, a province of large counties, Clare, Limerick, Tipperary, Kerry, Cork, and Waterford. In no part does it include such expanses of bogland as those which mark the central plain. A good deal of upland country, formed of shales and sandstones like those of the Leinster coalfield, but containing no good coal, occupies Clare and Western Limerick. The east-and-west upfolds of Old Red Sandstone (p. 44) begin to show through the limestone south of Limerick town, and they form bold ranges that mould the whole country and influence the lines of communication throughout Cork and Kerry. The east of Waterford, however, spreads across the south end of the Leinster Chain, and is thus concerned with the still older crumplings of the region.

2. The road and railway from Dublin to Cork are compelled at some point to cross the southern ranges. They get through Tipperary by keeping to the limestone land between the Slieve Felim and Devil's Bit range and the mass of the Galtees. They continue westward to a gap between the Ballyhoura Hills and the plateau of shale and sandstone around Newmarket ; and here they pass through to Mallow on the Blackwater, then climb out of this valley across Old Red Sandstone, and drop somewhat steeply to Cork beside a tributary of the Lee.

3. The passage round the Ballyhoura Hills on the Cork and Limerick border is that by which expedition after expedition went down from Dublin to the difficult country of the south, and through it Donall O'Sullivan Beare brought his surviving people in 1602, on that famous retreat to Leitrim, which is one of the greatest deeds in Irish history.

4. **CLARE** is bounded by the Shannon on the south and east, on the west by the Atlantic, which is always eating away the rocky coast, and on the north by a border that has no connexion with the structure of the land, except that it reaches Lough Derg along the high crests of Slieve Aughty. In the north of the county the Carboniferous Limestone must have been for a long time protected by overlying sandstones, for it still rises in great terraced plateaus, the edges of the level beds of rock standing out across the country like great steps. The Burren of Clare and the hills near Lisdoonvarna are swept clear of soil by the Atlantic winds ; but plants nestle in the deep crevices worn out in the surface of the limestone. Farther south, the fine-grained sandstones and the shales form superb cliffs along the coast. The Cliffs of Moher are nearly 700 feet in height, and face the Atlantic like a wall. At Kilkee and Loop Head the action of the waves in working out the shales and undermining the sandstones is well seen.

5. The submerged portion of the Shannon valley (p. 52) provides quieter water, and mudbanks gather in the broad mouth of the Fergus

as it comes down from Ennis to join the Shannon. Numerous small lakes occur on the low limestone country between the Fergus and Lough Derg ; but this region is a mere band between the upfolded Old Red Sandstone masses that form Slieve Bernagh and Slieve Aughty. Scarriff Bay on Lough Derg is an inlet on this band of limestone.

6. **Ballyvaughan** is a fishing port on Galway Bay. **Lisdoonvarna**, in the terraced limestone region, has become a health resort, owing to springs containing compounds of sulphur and iron. **Miltown Malbay** lies on the open coast which proved fatal to so many vessels of the great Armada of Spain. **Kilkee** is another resort of visitors. The inland town of **Ennis** is so named from its position on meadow land, like an "island," beside the Fergus. Its chief monument is a fine Franciscan abbey. **Killaloe** is beautifully placed in the east of the county on the outlet from Lough Derg, where wooded hills rise on both banks of the Shannon. It commands the road to Nenagh and the east, and was fitly chosen for Brian Boru's palace of Kincora.

7. The tablelands of sandstone and shale that occupy the south of Clare continue on the western border of **LIMERICK**, and streams run west from them across Kerry to the Atlantic and east into the tributaries of the Shannon. The tidal inlet of the Shannon forms the northern border of the county, and the foaming rapids of Doonass or Castleconnell (p. 52) lie above Limerick city towards Lough Derg. The mass of Slieve Felim rises on the

north-east, and the eastern border of the county cuts the Galtee Mountains and passes through the summit of Galtymore. The southern border runs along fairly high country, except for the gap, occupied by limestone, west of the Ballyhoura Hills. Relics of old volcanoes, which broke out long ago when the sea of Carboniferous times occupied the country, make irregular ground south-east of Limerick city. Picturesque ruins of castles stand upon many of the hills formed by the hard igneous rocks.

8. **Limerick** is an important city, with handsome remains of the fortifications which protected it down to the famous siege of 1691. It forms an unrivalled centre for the butter and bacon industries of the west. Several small harbours, such as that of **Foynes**, lie on the long sea-inlet below the city. The railway to Tralee in Kerry runs across the county, and the main line from Dublin to Cork passes through **Kilmallock**. The great number of ancient abbeys and castles in the county render it well known to students of history, and the Franciscan abbey of **Adare**, erected in the 15th century, is one of the most beautiful buildings in Ireland.

9. **TIPPERARY** extends from the Little Brosna River on the border of King's County to the Knockmealdown Mountains and the Suir, a distance of sixty miles. It is a fairly level limestone country in the north and south, and the broad mass of Slieve Felim and the Devil's Bit range, running north-east,

forms high ground across the centre. The water from the north-west flank of this barren upland runs to the Shannon, and that from the south-east side falls into the Suir. Templemore, Thurles, the fine old abbey of Holycross, Caher, with its picturesque castle, Clonmel, and Carrick-on-Suir, all stand upon the Suir, which has thus greatly influenced man's settlements in the county. Tipperary town, however, lies in the rich meadow-land north of Slievenamuck and the Galtee Mountains. The railway from Limerick to Waterford passes through it, but the Cork and Dublin line crosses this a little north-west of the town at Limerick Junction, a spot much better known to travellers than the old Norman settlement close at hand. The great road from Dublin runs south of the railway, through Cashel and Tipperary. Cashel, in the southern plain-land, is built about a dome of limestone, which was bent up steeply, and which has become weathered out as a small cliff-girt hill. It is so conspicuous as to have received in old times the name of "the fairy's ridge." On this eminence a stone fort or cashel must have stood. It is now superbly crowned by an old cathedral, a round tower, and a high stone cross, all enclosed within a fortress wall. Cormac's Chapel, attached to the cathedral, is adorned with singularly rich carving. The whole group can be seen from many miles away across the level land (Fig. 20). Fethard, to the south-east, is a pleasant little town, still retaining its mediæval walls and towers. At Clonmel the

scenery, with the broad river running under the wooded slope of the Comeragh Mountains, is extremely beautiful. **Carriek-on-Suir**, lower down, and on the border of Kilkenny, is even more attractive, with its old quay along the river, its quaint houses, and the great mass of Slievenaman rising

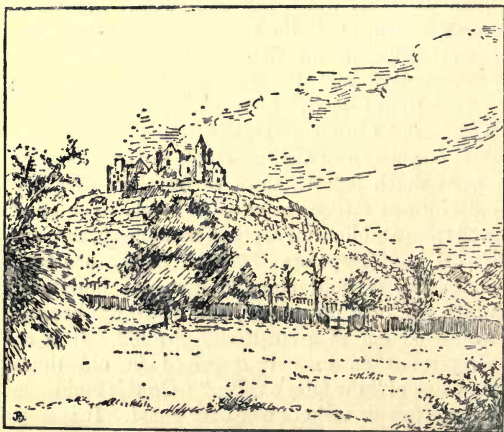


FIG. 20.—Cashel of the Kings.

immediately on the north. The Old Red Sandstone ranges make a fine boundary to the south of the county, and from Caher a road to Lismore climbs boldly across the moorland of the Knockmealdown Mountains, under the highest summits of the chain. **Nenagh** lies north of the Silvermines Mountains,

a part of the Devil's Bit range, on a downfold of limestone that joins the plains of King's County and Roscommon. A direct road and railway from Dublin to Limerick pass through it to the valley of the Shannon.

10. The limestone areas of Tipperary are largely covered by boulder-clay, and yield rich pasture and tillage soils. As in many other parts of Ireland, the limestone itself contains sufficient clayey matter to give a clay soil on its surface when the carbonate of lime is dissolved away. In the hollows between the sandstone ranges, as in the beautiful Vale of Aherlow, woods gather along the streams. Sand washes down from the uplands, and lightens some of the stiff soils in the lower ground. Deltas of sand, with fir woods growing on them, may thus be seen at the foot of the Knockmealdown slope above Clogheen.

11. **KERRY** has clearly lost part of its land by the dropping of the west coast towards the Atlantic. The sea comes into the heart of it at Tralee, Castlemaine, and Kenmare. The crumpling of the country has allowed the upfolded limestone to be worn from off the sandstone ridges, and the low ground between the ridges, where the limestone still remains, has been in large part entered by the sea. The east of the county is occupied by the plateau of shale and sandstone, overlying the limestone, which stretches southward from the Shannon to the Flesk valley at Killarney. The limestone country forms a lowland band

winding through the middle of the county from Ballybunnion to Tralee, Castleisland, and Killorglin.

12. The estuary of the Shannon bounds Kerry on the north ; on the south, the border runs along the ridge between the inlets of Kenmare and Bantry, but cuts across northward between Slieve Miskish and the Caha Mountains, leaving the end of the promontory in County Cork. On the east, it keeps to high ground on the watershed of the Derrynasaggart Mountains, strikes along the upper part of the Blackwater east of Killarney, descends northward along the River Feale to below Abbeyfeale, and then makes for the Shannon bank at Tarbert.

13. The area that can be farmed in Kerry is comparatively small. Human settlement on the great seaward-stretching promontories is limited to the coast. Killarney lies at the foot of the Carboniferous plateau that stretches northward, and the Lower Lake, with its low north-eastern shores, reminds us of those of the limestone plain. Directly, however, we leave the limestone and travel southward into the Old Red Sandstone ranges, the lakes and rivers have steep banks, on which the bare rock often shows itself, and where woods climb in valleys sheltered from the wind. The Upper Lake of Killarney lies entirely on the hard pebbly sandstone, and its floor and sides have been worn by the glacier that at one time moved down the valley. Fine cirques, bounded by sheer cliffs (p. 61), occur in the valley-heads, and

moraines formed of great ice-borne blocks cross the valleys like huge walls. Lough Guitane, east of Killarney, is held up above the Flesk by a moraine. The range of Macgillicuddy's Reeks includes Carrantuohill, 3,414 feet above the sea, the highest peak in Ireland, and P. W. Joyce shows us how the name, which means "an inverted reaping-hook," refers to the curved edge of the ridge, with its rocky teeth sticking out on the opposite side to those of the notches on a sickle. The scenery of the Reeks is bare and majestic. The ice-worn Gap of Dunloe (Fig. 11) cuts across the ridge west of Killarney, and the hollow of Cummeenduff, south of it, is one of the wildest glens in Ireland. At its foot the foaming stream falls into the Upper Lake of Killarney, amid a delightful broken country where vegetation and bare rock are continually contrasted.

14. The roads in Kerry are designed with well-graded curves across the hills, and the two most remarkable are that from Killarney to Kenmare and that over the pass of Ballaghbeama, connecting the Kenmare inlet through Glencar with the limestone lowland of Killorglin.

15. Tralee is a centre of business near the coast, between the eastern plateau and the ridge that forms the Dingle promontory. A light railway crosses this promontory between Slieve Mish and Beenoskee to the fishing town of Dingle. Brandon Hill (3,127 feet) rises nobly above Brandon Bay, and west of it lies a group of small fishing villages,

where the stone houses and the general conditions of life are of a simple and primitive character. The ancient Irish beehive buildings are still erected here as sheds for cattle and even for hens. The **Blasket Islands** are inhabited by fishermen, who, like those on the mainland, use currachs, or skin-canoes, which can be carried on the heads of two men, and in which they face the Atlantic waves.

16. The long inlet of Dingle Bay leads up to the shallow harbour of **Castlemaine**. Its south shore is steep, and carries the road and railway to **Cahersiveen**, winding high above the sea. Four of the great telegraph lines to America start from **Valencia Island**. **Kenmare** is a small town beautifully placed at the head of another long inlet, which is the drowned and most important part of the Roughty valley. A road from Kenmare crosses the southern watershed by a tunnel, in a country of rocks scoured by the ice, and descends in great windings to Bantry Bay.

17. The county of **CORK** in the west resembles that of Kerry, with its drowned valleys and outstanding isles, and on the east has a less rugged surface, where it presents the character of a great uplifted plain into which the rivers have cut down. This plain, much dissected, can be traced across Waterford into Cornwall. The structure of the county is due to the great earth-folds running from west to east. Their influence on the rivers has been mentioned on p. 54. The limestone that is

common in the country to the north is here very largely represented by slaty rocks, which occupy the downfolds south of the Lee. In the north of the county, near Kanturk, steeply folded beds of coal occur. A broad area of Old Red Sandstone occupies the centre of the county, and extends right across it from west to east. This accounts for the somewhat barren lands around Macroom. The deposits from the ice-sheets are somewhat thin, but they frequently supply clayey soils in the sandstone areas.

18. On the west the county-boundary is the same as that of eastern Kerry. On the south it is formed by the Atlantic, and the great ocean-liners look out for Cape Clear, which is part of a sunken sandstone range, and then steam up to St. George's Channel in sight of land. The eastern border cuts across the structure of the country to the west corner of the Knockmealdown range. From this the northern boundary goes westward along the Ballyhoura Hills, crosses the lowland gap, and rises on the plateau of Mullaghareirk.

19. Charleville is placed in the gap, where the highway turns down to Cork. This road passes through **Buttevant**, with its Franciscan abbey and a castle, and crosses the Blackwater at **Mallow**. Here the general east-and-west structure of the county is seen in the course taken by the railway westward to Killarney and eastward to Cappoquin, in both cases along the narrow valley of the Blackwater. **Fermoy** is as pleasantly placed in the wooded

limestone vale as Mallow, and a branch-line runs north from it to Mitchelstown. Millstreet lies west of Mallow, in somewhat more mountainous country on the Killarney road.

20. The Boggeragh Mountains, south of the road, prevent the growth of towns in this region, and beyond them we find streamlets running to the Lee. Macroom lies in a bleak upland on the Lee ; the railway from Cork at present ends here, and the country to the west is wild, and typical of the Old Red Sandstone regions. After passing the long lakes at Inchigeelagh, the road crosses southward by the narrow Pass of Keimaneigh, which was probably cut in the ridge by water flowing from a melting glacier. Near at hand on the north lie the lake and isle of Gouganebarra, the rocky retreat of St. Finnbarr or Barra, the true founder of Cork city. The road drops from the pass to Bantry, at the head of a noble inlet of the Atlantic. Glengariff, a village beautifully placed on the north side of the bay, facing a number of ice-worn islands, lies on the road across the mountains to Kenmare (p. 88). Farther down the inlet is Castletown Bearhaven, with copper mines on the promontory west of it.

21. A road and a railway, making good use of the valley of the Bandon River, run from Bantry to Cork, passing through Dunmanway and Bandon. Skibbereen, Clonakilty, and Kinsale, with its fine winding harbour, are reached by branches to the south. Baltimore, in the partly drowned country

near Clear Island, is probably the most northern spot that has suffered from the Mohammedan raiders of Algiers. These daring seamen, repeating the inroad of the Mediterranean tribes of far more ancient days, sacked the town in 1631.

22. When St. Finnbarr, about the end of the sixth century, descended from Gouganebarra by the natural highway of the Lee, he found in the "great marsh" at its mouth a lowland for the foundation of a school. From this settlement **Cork** arose, a town strengthened by the Norsemen in later times. To-day it is the chief city of Munster, with a College of the National University; and through it pass the business and traffic of the south. Steamers come up from the sea to its quays, and the drowned valley of Cork Harbour admits ocean-liners to the port of **Queenstown** on Great Island. The green hills descend steeply to the sheltered waters, and **Queenstown** is built in terraces on a slope facing to the south. A railway connects it with **Cork**, and north of it another line runs eastward through **Midleton** to **Youghal**.

23. **Youghal** lies picturesquely at the mouth of the **Blackwater**, and its sea-face is at times endangered by the waves. It contains a house occupied by **Sir Walter Raleigh**, a reminder of the most tragic days of Munster, now happily long since passed away.

24. **WATERFORD** is bordered on the north by the **Knockmealdown** range (Fig. 13) and the **River Suir**, on the east by the estuary of the

Suir, the Barrow, and the Nore, on the south by the sea, and on the west by an irregular line from the Knockmealdown range to Youghal. The grand masses of the Comeragh Mountains, formed of Old Red Sandstone, lie within it, rising boldly above the Suir and ending abruptly on the east above an upland of slaty rocks. On this eastern face frost and ice have carved out the splendid cirque of Coumshingaun, a hollow backed by a cliff 1,100 feet in height, and with a great semi-circular entry that is visible many miles away. A lake has gathered in its floor behind a moraine of tumbled blocks. Other lakes and hollows of the same origin lie in this part of the hills.

25. In the east of the county a number of very hard igneous rocks run as bars in a north-easterly direction, forming in reality part of the west flank of the Leinster Chain. They produce ridges on the surface among the slates, and furnish excellent metal for the roads.

26. Lismore lies on the south bank of the Blackwater, which runs here in a beautiful valley among woods. The great castle, representing the ancient fort, towers above the bridge that carries the road from Caher. The brown moors of the Knockmealdown Mountains form a noble skyline on the north.

27. From Cappoquin, a pleasant town at the southward bend of the stream (p. 54), the Blackwater is navigable to the sea at Youghal.

Dungarvan lies on a broad harbour to the east, and the road and railway continue to it from Cappoquin, forming part of the route from Cork to Rosslare, and so to England. The ruins of a castle and of an abbey on the north of Dungarvan lend picturesqueness to the mouth of the Colligan River. A road climbs north to the slaty plateau, and passes under Coumshingaun to Carrick-on-Suir. Another interesting road reaches Clonmel along the west side of the broken Comeragh Mountains.

28. A district famous for its copper mines lies on the coast between Dungarvan and Tramore. Tramore is a town much visited in summer, with a sandy bay east of it, and a wave-cut rocky coast upon the south. Waterford city (Fig. 3) lies a few miles to the north, with a long quay on the south side of the Suir. A round castle-tower here recalls the days when Strongbow and his Normans landed, and followed from this fortified town the line of the Leinster Chain till they drove the Danes from Dublin. Steamers run to England from the long and quiet inlet, and the city has shared in the general growth of prosperity in recent times.

CHAPTER VIII.

CONNAUGHT.

1. Connaught includes the great and partly mountainous counties of Mayo and Galway, together with Sligo, Leitrim, and Roscommon. A very large portion of the province consists of limestone plain-land, where the slabs of rock come near the surface, and where rivers sink into and emerge elsewhere from the ground ; but in the west the older rocks stand up boldly, bearing relics of Carboniferous Limestone or Sandstone on their heights, which show that they were once buried in the deposits of the Carboniferous sea.

2. In old times, in this broad country west of the Shannon, communication with the outside world was never easy. Ships came to the port of Galway from the Mediterranean, and the Normans established themselves both here and at Athenry in the thirteenth century. The O'Conors, strongly rooted in Connaught, suffered more from their Irish neighbours than by interference from without. If steamship-routes are established from Belmullet or Galway across the Atlantic, Connaught will become better visited and better known. The wild scenery of Connemara and Achill Island have long attracted visitors ; and the beauty of Sligo and the north of Leitrim, where

the glens, carved out in terraced limestones, reach almost to the sea, cannot be surpassed in any part of Ireland.

3. The great through-route of Connaught lies in the south, along the low ground that stretches from Dublin to Galway across the plain. It crosses the Shannon at Athlone (p. 63) and the Suck at Ballinasloe. A railway runs easily from Athlone through the level country of Roscommon to Clew Bay. Sligo is reached from Dublin through Longford (p. 63) and Boyle, and has a somewhat indirect connexion by rail with Belfast through Enniskillen.

4. Next to the great expanse of limestone, the range of Slieve Gamph, or the Ox Mountains, is the most striking feature of the province, running north-east from Castlebar in Mayo to Manorhamilton in Leitrim. The hollow cut across it at Collooney by the river flowing from the south admits the road and railway from Dublin to the Sligo coast. Great lakes have been formed by the drainage of the western mountains of Connaught, where the water spreads out upon the limestone plain, and an almost continuous band of water runs from Ballina to Galway town.

5. The western shore of the province, with its irregular promontories and indentations, and its numerous outlying islands, shows most distinctly the features of a sunken coast. At the same time, the sea has been active in carving out cliffs and cutting away projecting headlands, and the wilder

parts of Connaught seem always to be engaged in a struggle with Atlantic storms. The ancient crystalline rocks resist far better than the limestone, and at Sligo and Galway, where the limestone comes out on the coast, the country has been worn back and the sea penetrates the plain.

6. The county of **SLIGO** finds a sort of backbone in Slieve Gamph and the continuation of the range east of Collooney. The granite and other crystalline rocks of these hills have been crossed by glaciers in the Ice-age, and show bare rounded surfaces, on which boulders remain strewn in many places. The Carboniferous Limestone lies to north and south, and rises in the east of the county as high plateaus, of which the most conspicuous is Ben Bulbin (Fig 21). This great flat-topped mountain rises, like a huge fortress, above the coast-road to Bundoran, and bears on its crest a layer of the sandstone that stretches more continuously to the east. South-east of the Ox Mountain ridge, this sandstone forms an upland, with shales and even coal-seams over it. While the Ox Mountains represent the more ancient system of Irish earth-folds, a ridge of the later folding appears as the Curlew Hills, running nearly east and west on the south border of the county between Ballymote and Boyle. The Old Red Sandstone here forms a small but striking range, rising picturesquely above Boyle, and giving a superb view from its crest over the region of terraced Carboniferous

Limestone round Lough Arrow. This ridge, forming a barrier for the men of the north-west, has played its part in history, from the days



FIG. 21.—The Limestone Plateau of Ben Bulbin, from Grange, Co. Sligo:

of Brian Boru down to those of Hugh O'Donnell. Lough Gill, with its beautifully wooded shores, lies in a basin between limestone plateaus on the

north and the rounded Ox Mountain masses on the south. The crystalline rocks of the latter range are cut through by the Bonet River at Drumahair. The tributaries of this stream, running from the coal-bearing upland, clearly represent the original river, rising on beds higher than the crystalline chain ; and the hollow between the plateau and the chain, in which the main length of the Bonet runs in County Leitrim, has been cut out since the gap was made at Drumahair. The Unshin and Owenmore Rivers similarly run northward from the Curlew Hills, wearing away the limestone land, and their united waters cross the Ox Mountain gneiss in a picturesque gap (p. 95), as if they had climbed up the ridge and sawn their way down through it. This removal of the ground on which the streams first ran, and the resulting appearance of gaps across the hills, has been already mentioned in the cases of the Shannon (p. 49) and of the Leinster Chain (p. 53).

7. Lough Arrow, which drains northward, lies in a basin, scoured by ice and set with drumlins, among high and terraced limestone hills. The face of Keshcorran shows numerous caves, worn out by water that once flowed within the limestone underground. Here, as at Ben Bulbin, a great wall of vertically jointed limestone rises above a gentler slope formed by underlying limy shales. Lough Gara, in the extreme south of the county, belongs to the southern flank of the

Curlew range, and drains through Boyle and Lough Key into the Shannon.

8. **Sligo** is the one great town of the county, and, for beauty of position, has hardly a rival in the whole of Ireland. A broad stretch of river, some two miles long, connects it with Lough Gill, and Ben Bulbin towers to the north of it, above the entrance to the ice-worn valley of Glencar. On the west, the huge outlying limestone mass of Knocknarea, crowned by Queen's Maeve's funeral cairn, rises as a high dome against the sea. The ancient battlefield of Carrowmore, at the foot of Knocknarea, is marked by numerous cromlechs. The indented harbour of Sligo is well protected by headlands on the north and south, and steamers run thence round the north of Ireland to Liverpool and Glasgow. **Collooney** is a small town in the important gap across the Ox Mountains, and the river drops into the sea a little below it at **Ballysadare**, making a beautiful series of waterfalls across the limestone shelves (p. 57).

9. The road from Sligo to Bundoran, past the brown bogs of **Grange**, is partly sheltered by woods, and presents superb views of the limestone crags upon the landward side. That to Ballina also keeps near the coast, passing through **Dromore** and **Easky**. **Ballymote**, south of the Ox Mountain range, contains the remains of a strong castle. The county as a whole is rich in historic ruins and in stone graves and raths of prehistoric times.

10. **LEITRIM**, like Meath, has a narrow seaboard, being almost cut off from Donegal Bay by the boundaries of Sligo and Donegal. Thence it stretches down to Lough Allen, including an area of Carboniferous sandstone and terraced limestone by Lough Melvin, the crystalline rocks of the old ridge near Manorhamilton, and a high plateau of sandstone and shale that forms the Lackagh Hills. The coal-seams of the Arigna area occur where the county borders on Roscommon. Beyond Lough Allen, the domes of Bencroy and Slieve-anierin, "the iron mountain," are also capped by strata containing coal (p. 46), and south of them the country drops to a limestone lowland covered with glacial mounds. The round-topped mountains round Lough Allen thus separate two lower districts in the county, and they form a difficult country for main roads. **Manorhamilton** lies near the entrance to Glenade, down which the Bonet runs from a pleasant lake; its communications are with Sligo and Enniskillen rather than with the southern part of Leitrim that lies across the mountains to the south. **Drumahair**, the site of a castle of the O'Rourkes, stands on the Bonet near Lough Gill, in the midst of beautiful wooded scenery.

11. The Shannon (p. 51) enters the county on the north side of Lough Allen, and forms the western border on its emergence as a large stream from the lake. The village of **Leitrim** lies near it, and **Carriek-on-Shannon** is an important town

on the broad reach of the river, where it is joined by the water from Lough Gara and Lough Key. In the open country around **Ballinamore**, the watershed between the Erne and the Shannon is very uncertain, and some of the little lakes among the drumlins are connected with both river-systems.

12. **ROSCOMMON** is bounded on the north-west by the Curlew Hills (p. 96), and the Slieve Bawn range rises in the east; but in the south it is a plain with a large extent of bog-land. In the central area the grey limestone forms rising plateaus, and is covered thinly by the soil. Grass-lands prevail throughout the county. North of Strokes-town, numerous drumlins appear, running east and west and damming in Lough Gara and Lough Key. The road to Boyle from the passage of the Shannon at Athlone (p. 63) finds no obstacles but these drumlins. It bends a little in order to cross them, drops sideways down the other flank, and then continues on its easy way. The Shannon bounds the county on the east, and the Suck comes down along almost all the west. The choice of these boundaries accounts for the narrow form of the county.

13. Boyle lies on the rapid river connecting Lough Gara and Lough Key, and a fine, though ruined, Cistercian abbey stands above the stream. **Castle-reagh**, in the west of the county, commands the main routes from Athlone into Mayo. **Roscommon** is centrally placed in the county, out in the great plain, where a small hill was selected by the Normans for a

castle. The road from it to Athlone approaches the basin of Lough Ree, one of the largest of the many flooded hollows in the limestone.

14. The west of Connaught is as wild as any part of Ireland, and the great counties of Mayo and Galway fortunately include broad stretches of lowland throughout their eastern halves. Crystalline and metamorphic rocks prevail in **MAYO** from the north coast down to Achill Island, and along the moorland range of Slieve Gamph. A large part of western Mayo is extremely desolate, and is covered by mountain-bog. Among the old rocks there are many masses of quartzite (p. 7), which gives rise to mountainous domes. Nephin, 2,646 feet above the sea, is a conspicuous quartzite mass west of Lough Conn. Croagh Patrick, looking down on Clew Bay (Fig. 22), also owes its shape to quartzite, and small patches of this hard altered sandstone crown the hills in Achill Island. Here the western cliff of Croaghaun goes down almost 2,000 feet sheer from the mountain-crest to the Atlantic. The north coast also presents grand cliffs until the Carboniferous rocks are reached towards Killala Bay.

15. Clew Bay is a submerged hollow of the limestone plain (p. 36), covered with drumlins, which stand above the water as a multitude of islands. Clare Island, in the mouth of the bay, is a piece of the mountain country now surrounded by the sea. It is formed of similar rocks to those that have weathered out as barren flat-topped

masses on the north shore of Killary Harbour. Here Benburb, Muilrea (the "bare flat mountain"), and Ben Gorm make a grand frontier to the county, with the ice-worn groove of Doolough affording a passage in their midst. These mountains,

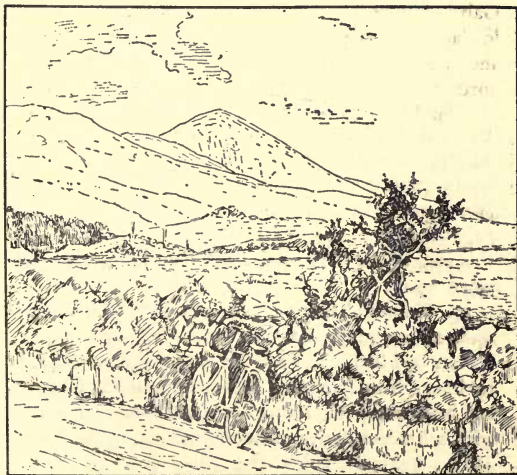


FIG. 22.—Croagh Patrick, from the east.

which are formed of rocks of the same age as those on the flanks of the Leinster Chain, are continued above the Erriff valley, and Loughs Carra and Mask lie upon their eastern flank. The south-western extension of Slieve Gamph divides a northern

from a southern lowland in the county, just as its north-eastern continuation divides Sligo. Lough Conn, with its low shores, above which Nephin towers, is hollowed out in the limestone on the north side of the range.

16. Up to 1914 only one railway had reached the west of Mayo, by way of the north shore of Clew Bay, where it runs on the edge of a downfold of Carboniferous rocks. The line from Claremorris to Ballina keeps east of Lough Conn, and crosses the chain of Slieve Gamph by the convenient valley of the Moy. The Moy can be traced south-eastward as the Gweestion, and this stream, like those that cut across the Leinster Chain (p. 53), once rose on high ground, which in this case lay to the south, and which has since been worn away.

17. Belmullet is a remote port in a wind-swept treeless country, on the neck between Broad Haven and Blacksod Bay, but with a good sheltered harbour, from which a steamer-route to Canada has been planned. **Ballina** is a small market-town, with salmon-fisheries, near the mouth of the River Moy. **Foxford** holds the Moy gap in Slieve Gamph. The wildness of the surroundings and the simple conditions of peasant-life have attracted numerous summer visitors to **Dugort**, a village under the dark cone of Slievemore in Achill Island. **Mallaranny** is a charmingly placed village in the wooded gap between Clew Bay and the irregular inlet of Bellacragher. **Newport** and **Westport**

owe their origin to fishing industries on Clew Bay. Castlebar, lying under a ridge of dark igneous rock, and Claremorris and Ballinrobe out in the great plain, are market centres in an agricultural

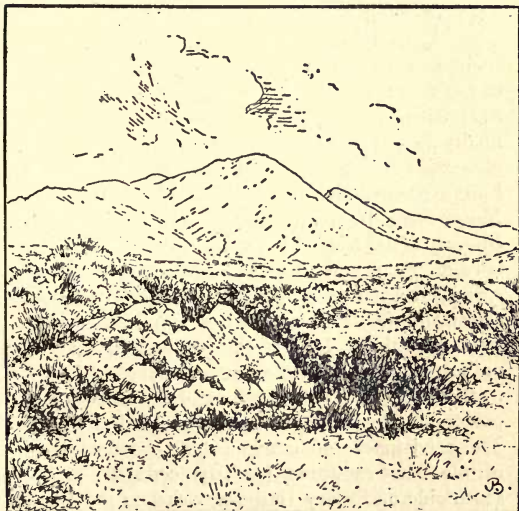


FIG. 23.—Quartzite Hills of Connemara. The Maamturk Mountains, from near Kylemore.

region. The soils are here so thin that the limestone ledges often crop out like steps and platforms on the surface of the ground.

18. The county of **GALWAY** opens, as we have already noted, with pure plain-land on the east.

From the Suck to Oughterard on Lough Corrib there is limestone across more than forty miles, while it extends for the same distance from the sandstone boss of Slieve Dart in the north to the edge of Slieve Aughty (p. 80) in the south. The Aran Islands, with their bare limestone shelves, show that this rock once spread farther to the west ; but it has been stripped off the older mountains of Connemara, and these now rise boldly above Lough Corrib and Lough Mask. The mountains of Galway are divided by Glen Inagh into the group of the Twelve Bens and the Maamturk Mountains. In both groups quartzite prevails (Fig. 23). Its bedded structure is well seen on the bare grey slopes, and ice-action has rounded and smoothed even these hard hillsides. The mica-schists of the same region have produced loamy soils since the melting of the ice, and their green or heather-covered slopes are in striking contrast to those formed of quartzite, or of the granite that penetrates these rocks throughout the south. The sandstones and coarse pebbly conglomerates of the Muilrea group (p. 103) continue on the south side of Killary Harbour, rising in moorland hills throughout the Joyces' Country. This district of deep gloomy valleys, where the lakes of the plain run up like fiords into the hills, receives its name from the Welsh settlers of the thirteenth century, who formed a noted family in Galway city, and who in time became as Irish as any dwellers in Connemara.

19. The name Connemara is also derived from a family, and means "the race of Conmac by the sea." This district was the poorest of Conmac's lands in Connaught, though the indented coast has allowed a number of fishing villages to spring up. Clifden lies at the end of the railway, with a grand background of mountains on the east, and a rainfall, due to them and the Atlantic, of 80 inches in the year. The famous green marble of Connemara is quarried near Clifden and at Recess. South of the railway, boggy land, with numerous lakelets, extends over worn-down granite to the coast of Galway Bay. This dreary lowland of Moycullen is practically uninhabited, for the coast alone provides a livelihood. Things are very different when we reach the limestone on the east, though here the rock shows too freely through the soil. Ice-borne boulders from Connemara lie upon it; but the absence of drumlins of boulder-clay and the porosity of the rock prevent the formation of the numerous small lakes that are a feature of the limestone lands of Cavan. Oughterard on Lough Corrib is a bright little town. Headford and Cong are celebrated for their ancient abbeys, and St. Jarlath's town of Tuam is still an educational centre. One of the youngest Irish railways now runs through Tuam, crossing the main line from Dublin to Galway at the old walled town of Athenry; and travellers can start from Sligo or Ballina, steam across the limestone lowland down

to Limerick, and thence, still on limestone and avoiding the Old Red Sandstone ranges, by the valley of the Suir to Waterford. The journey occupies ten or eleven hours, but it furnishes an interesting study of how the nature of the underlying rocks affects the communications of a country.

20. Galway city was founded where the river runs out as a broad stream from Lough Corrib, and where the great bay, a submerged part of the plain, attracted commerce from European lands. When the central plain was wooded and its tribesmen were of uncertain temper, this port was the doorway of Connaught, just as Dublin Bay is the doorway of Ireland on the east. One of the finest buildings in Galway is the College of the National University. **Ballinasloe**, where traditionally the hosts gathered at the ford upon the River Suck, is the frontier town of the county on the route to Dublin. P. W. Joyce suggests that the great fairs held here are a survival of old tribal gatherings. From **Loughrea**, near a small lake, the ground rises southward to Slieve Aughty on the border of Clare, and the region of grass-lands and sheets of limestone is changed for uninhabited moors. The broad Shannon, forming the south-east frontier, is bridged at **Portumna**, just before it passes between its level shores into Lough Derg.

CHAPTER IX.

ULSTER.

1. The province of Ulster occupies the country between the wild coast north of Sligo and the gentler shores of County Down. It includes the counties of Donegal, Londonderry, Antrim, Tyrone, Fermanagh, Monaghan, Armagh, Down, and Cavan. Branches of the limestone plain run up through Cavan into Monaghan and Fermanagh; but otherwise the surface of Ulster is very varied, and it contains in the north-east broad stretches of basaltic lava.

2. This volcanic outpouring covers the earlier rocks in eastern Londonderry and in Antrim; but the exposure of gneiss and schist (p. 10) near Fair Head and Cushendun shows that the old series of folds runs everywhere beneath the surface. The same schists and gneisses prevail in Donegal and the west of Londonderry, and in central Tyrone there is a ridge where some of the very oldest rocks of Ireland come to light. The north-east and south-west folding gives us an upland of shale and sandstone in southern Cavan, central Monaghan, Armagh, and Down (p. 39), and a great mass of granite comes up along the main fold, between Bessbrook and Slieve Croob, reminding us of that which forms the backbone of the Leinster Chain. The sandstones and slates

above the Carboniferous Limestone provide mountainous features where the Shannon rises on the border of Cavan and Fermanagh, and hummocky drumlins are common on the limestone region. Thus there are few parts of Ulster where we may look for level land. The largest lake in the British Isles, Lough Neagh, the "lake of Echach," has gathered in a downfold of the basaltic country. Tradition tells us that the land here became flooded in historic times; but the sea entered the hollow as far back as the Ice-age. It is probable that the waters of the Bann spread over the district when the sea-inlet was destroyed by a slight rise of the north coast and a tilting of the country from north to south. This tilting may well have occurred since man came into Ireland.

3. The main structure; then, of Ulster runs from south-west to north-east, and the roads and railways take winding courses through the hills. The great route from Dublin to Belfast climbs rapidly into Armagh on a moorland formed by slate and granite above Dundalk. The road drops into the deep valley at Newry, the lower part of which lies drowned as Carlingford Lough (p. 37); but the railway has to strike higher up this valley, and crosses a low pass (Poyntzpass) to the descent along the Bann. The road meanwhile crosses numerous hills, until it meets the Lagan vale at Lisburn. To reach Londonderry, one railway goes from Portadown to Omagh, taking advantage

of small valley-cuts and avoiding the moor in the centre of Tyrone ; when it strikes the Strule, its northward way is clear. The other line has to follow the coast from Belfast, until a gap is reached in the black basaltic cliffs. Here it curves back so sharply that the engine is taken to what has been the rear of the train, and draws it in the reverse direction up the slope. Then the line aims at Coleraine along the back of the basaltic slope, and is forced to cling again to the foot of the cliffs on its way round to Londonderry by Lough Foyle. Between these two routes there is a region in Ulster, centring in the Sperrin Mountains, as large as the Mayo moorlands and quite as untouched by railways.

4. Mountainous Donegal has been penetrated by light railways, and Donegal Bay is connected with Dublin by a full-gauge branch-line starting from Dundalk. This crosses the lower part of the folded slates and sandstones in County Monaghan, and keeps as far as it can to limestone country along the valley of the Erne.

5. During the Ice-age, ice from Scotland moved across eastern Ulster. The Irish ice flowed in two directions from a huge accumulation of snow that gathered over Fermanagh (p. 28), so that we find boulders carried northward across Tyrone and Londonderry, and southward into Cavan and Monaghan. The latter counties contain numerous drumlins, closely set, and damming up little lakes between them. The rivers, which were disturbed

by the dropping down of this material in their earlier courses, are now finding their way among these recent hills. Magnificent gravelly eskers wind like serpents northward from the moorland of Tyrone, and boulder-clays and boulder-gravels are responsible for much of the soils in Antrim.

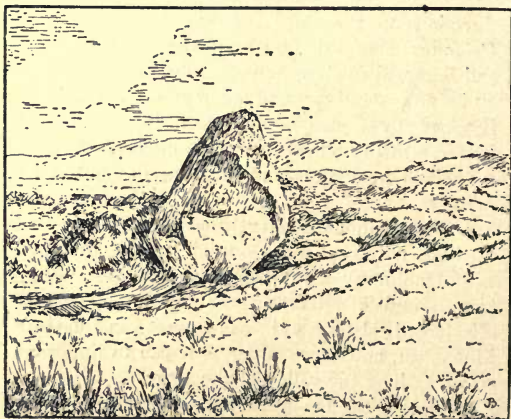


FIG. 24.—Ice-borne boulder near Narin, Co. Donegal.

In parts of Donegal the ground is heavily cumbered with granite blocks, once carried by the ice (Fig. 24).

6. The east side of Ulster lies so near to Scotland that frequent communication between the two countries has been natural. The Scots, an Irish tribe, founded important colonies in Galloway,

and thence spread northward, carrying their Gaelic speech into the Highlands, and giving their name to the whole country. St. Columba found himself among a friendly people at Iona, and Irish missionaries taught in Scotland, as they did in other European lands. In the course of time the MacDonnells of the Isles returned to the Glens of Antrim, and later settlers from southern Scotland founded many of the present families in the province. It is interesting to notice that the rocks of western and southern Ulster run on into the Scottish Highlands, while the basaltic plateaus, which occur in no other province of Ireland, are repeated in the isles of Mull and Skye.

7. **DONEGAL** consists almost entirely of ancient rocks, into which great masses of granite have forced their way. In the east, mica-schist is sufficiently abundant to produce loamy soils, and the country near Letterkenny presents a green and pleasant contrast to the moorlands farther west. Muckish and Errigal, the two most conspicuous mountains in the county, are both formed of quartzite. Aghla Mountain is a fine bare ridge of quartzite, rising above Lough Finn. The main north-east and south-west lines of the county are well seen in this range and in the course of the Gweebarra, which rises in the Derryveagh Mountains and flows almost straight south-west to the sea. Close to its head the Owenbeggagh starts north-eastward through the great glen down to Sheep Haven (Fig. 25).

8. The pleasant town of **Letterkenny** is the gateway for the north-west highlands, and two roads rise from it into the hills. The main road and the light railway cross the granite



FIG. 25.—Above Doocharry Bridge, in the highlands of Donegal. The head of Glenveigh is in the distance.

ridges by the pass of **Barnesbeg**, and thereafter keep fairly to the slopes above the coast. It may be said that one road runs round the highland country, through **Creel**, **Dunfanaghy**, **Dunglow**,

Glenties, Ardara, Killybegs, Donegal, and Stranorlar. But the piece between Dunglow and Glenties is quite modern, and the old route went steeply up and down across the ridges by Doocharry Bridge. The valley of the Finn has enabled a road and a light railway to get directly from Stranorlar across to Glenties.

9. The western promontory above Donegal Bay is very difficult to traverse, and is entered along its southern coast. The great sea-cliff of Slieve League, carved out in quartzite, is more than 1,900 feet in height. Donegal Bay has been formed in a downfold of Carboniferous Limestone and Sandstone, and its shores lie in milder country. Relics of soft sandstone in the north-east at the head of Lough Foyle show that this broad inlet also depends on the nature of the rocks that form its floor.

10. A desolate and partly bog-covered moorland lies on gneiss and granite in the south-east of the county round Lough Derg, which must not be confused with the great Lough Derg upon the Shannon. The contrast is delightful as one descends from this upland to the wooded shores on the Carboniferous strata along Lough Erne.

11. The towns named above, from Creeslough to Killybegs, are in reality only large villages set upon the coast-road, with fishing industries, and an income in summer from lovers of wild scenery and sport. Burton Port has grown up in recent years a few miles north-west of Glenties, where

the northern railway ends against the Atlantic. Carboniferous Sandstone is quarried largely at Mount Charles, west of Donegal town. Donegal is charmingly placed at an angle of the bay, and the pass of Barnesmore, north-east of it, allows it to be easily reached by a road and a railway from Stranorlar. It is now also usefully connected with Ballyshannon, on the line from Dublin to Bundoran. Bundoran, in the extreme south-west of the county is in an open position, but forms a bracing seaside resort. The River Erne flows rapidly to the sea in a picturesque valley at Ballyshannon, and the main part of the town rises steeply on the northern bank.

12. Pettigo, a border-village above Lough Erne, is the starting-point for pilgrimages to the lonely monastery associated with St. Patrick on Lough Derg. Ballybofey and Stranorlar are neat towns on opposite sides of the Finn, in the east of the county, where trees are fairly common and arable land begins to prevail. Lifford is the county-town, and was long held by the O'Donnells on the frontier-river opposite Strabane. Buncrana stands above Lough Swilly on a terrace a little inland from the shore, and the ground below it has been used for new houses for summer-visitors. The great promontory of Inishowen spreads to north of it, ending in the cliffs of Malin Head, which is the first land sighted by the Canadian liners coming east. Moville, near the narrow mouth of Lough Foyle, is a place of call for Atlantic steamers.

13. The western part of the county of **LONDON-DERRY** continues the schist-land of eastern Donegal, with moorlands rising 2,000 feet above the sea. On the lower slopes the yellow loamy soils yield farming land. The southern boundary is carried along the crest of the Sperrin Mountains, a district very seldom visited by strangers. An exposed road crosses this range from **Draperstown** to Londonderry. The boundary runs south from the Sperrins along the watershed between the Foyle system of streams and those flowing to Lough Neagh, and crosses a fine pass at the west end of Slieve Gallion. The country here is singularly wild in contrast with that on which we descend at **Moneymore**. Here soft sandstones and white limestone, overlying the old schists, provide a fairly fertile land. The eastern border of Londonderry is formed by the shore of Lough Neagh, where basalt extends down to the water's edge from the hills near Moneymore, and by the River Bann as far as Colebreene, where it crosses to the east to include the Liberties of Coleraine.

14. The eastern part of Londonderry resembles Antrim. The great wall of basalt stands above the northern shore and runs south from Downhill to Dungiven. Here and there a band of chalk (white limestone) is seen under the black lavas, which have protected this yielding rock from being worn away. Soft clays and sandstones, younger than the Carboniferous rocks, lie beneath the chalk and give red soils. The flat land from

Limavady to Magilligan Point is a raised coast-plain with blue clays and marine shells, and was produced by one of the latest uplifts of the land. Lough Foyle formerly spread much nearer to the basalt cliffs. Basalt moorlands stretch south to the basin of Lough Neagh, and the old road from Coleraine to Londonderry climbs across them, dropping again quickly towards Lough Foyle. The River Roe has cut a young valley set with cliffs from a pass west of Maghera through Dungiven to Lough Foyle.

15. Londonderry city is beautifully placed on the River Foyle, where this receives tidal water from Lough Foyle. The town rises mostly on the west bank, and the old gates and walls still remind us of its famous siege. A large export and import trade is here done by steamers that come right up to the quaysides in the town. Both the principal lines of railway into Donegal now start from stations in Londonderry, one on each bank of the Foyle, and two other stations form terminuses for the lines from Dublin and Belfast. Five miles west of the city, the remains of the great pleasure-palace or Grianan of Aileach, the residence of the O'Neills in prehistoric times, are clearly seen on a hill within the border of Donegal. They may perhaps be looked on as a forerunner of the city of Derry on the Foyle.

16. The other towns in the county, some of which have been already mentioned, are mostly small clean centres for local markets in a country which is difficult to cross. The traffic of Coleraine,

a large town on the Bann, is mostly with the county of Antrim on the east, and the railway runs through it from Belfast to Portrush.

17. **ANTRIM** is almost entirely a basalt country. Ice-borne deposits, in some cases imported by a

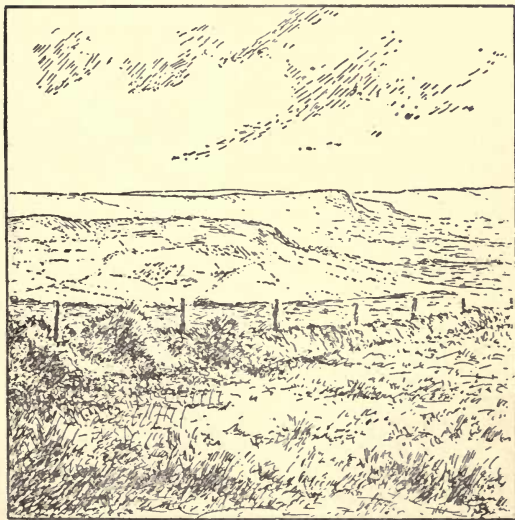


FIG. 26.—Basaltic plateaus of Co. Antrim, looking north from Cave Hill.

glacier from Scotland, have left clays and sands upon the surface ; but towards the east the lavas rise in terraced moors (Fig. 26). The one true mountain

of Antrim is the bold mass of Slemish (p. 45), a volcanic neck that stands out above the general plateaus. White limestone appears picturesquely under the basaltic lavas near Portrush, and all



FIG. 27.—Coal-seam in sandstone, east of Ballycastle
Fair Head in the distance.

along the coast-road from Cushendall to Belfast. The **Giant's Causeway** lies at the foot of fine basalt cliffs on the coast north of Bushmills, and is due to the cracking of a great lava-flow into

regular columns as it cooled. Similar columns may be seen in the basalts high upon the cliffs. Fair Head shows a grand cliff of coarse columnar basalt above a slope of huge down-tumbled blocks, and is one of the noblest features on the Irish coast (Fig. 27).

18. The Bann and the east half of Lough Neagh form the western boundary of the county, and the southern boundary runs from the south-east corner of the great lake into the Lagan valley, which it follows to Belfast Lough. All the rest is sea-coast, and the slipping outward of the basalt from its high edge over the more yielding rocks below makes the east side highly picturesque. The red sandstones and clays of the Londonderry area (p. 117) reappear in the lower and wooded slopes near Belfast, and they colour the whole country along the Lagan valley.

19. **Portrush**, on a platform of basalt, is a fishing village which has grown into an important summer resort. An electric railway connects it with Bushmills and the Giant's Causeway. **Ballycastle** is another pleasant town on the coast, under the great dome-shaped hill of Knocklayd. The Glenshesk River here comes down from a highland of gneiss and mica-schist, on the north side of which is a coal field (Fig. 27) in rocks of the age of the Carboniferous Limestone. A hilly road strikes over this country, crosses Glendun by a bold bridge, and at **Cushendall** passes into the great coast-road of the county. The beautiful and often

wooded Glens of Antrim have been cut by streams which descend swiftly from the edge of the basalt to the sea. Glenariff, the finest among them, is traversed by a road that connects Ballymena with Red Bay. This bay takes its name from the red rocks beneath the chalk. Larne lies at the mouth of a long sea-lough, which is a drowned valley between the promontory called Island Magee and the main basaltic hills. The sheltered inlet and a raised gravel beach, which provides a convenient platform for the railway-terminus, have led to the making of a line from Belfast to Larne, connecting with mail-steamers to Stranraer in Scotland. The sea-passage, across the deepest channel of the Irish Sea (p. 3), is only thirty-five miles in length, and a quick route to Glasgow, Edinburgh, and London is thus secured.

20. Carrickfergus is marked by a great castle, well placed on a basalt spur jutting into Belfast Lough. The edge of the basalt plateaus grows still nobler from this point southward to Cave Hill and Divis (1,567 feet) above Belfast. At Greenisland the Portrush and Londonderry line climbs up a glen to get over to the Lough Neagh basin (p. 111).

21. The towns of the interior of the county are naturally placed on the lower ground, where the basalts slope down almost to the level of the lake. Streams flow from the plateaus and unite in the Main, which enters Lough Neagh from the north at Antrim Bay. It is interesting to note that this

water soon runs back again northward through the outlet of the lake into the Bann. **Antrim** is pleasantly placed at the north-east corner of the lake. **Ballymena**, clean and well-kept, like so many of these northern towns, is an important centre of the linen trade. It lies on the **Braid River**, a little above its junction with the **Main**. This river and other tributaries of the **Main** rise on the high back of the basalt lavas only some four miles from the eastern coast. Light railways run hence to **Larne** and to **Parkmore** at the head of **Glenariff** (p. 122). A branch-railway runs from **Ballymoney**, through a country cumbered with ice-borne gravels, to the fishing port of **Ballycastle** (p. 121).

22. The great industrial city that contributes so much to the prosperity of Ireland lies in the southern part of the county. **Belfast** (the "ford at the sandbank") has developed with remarkable rapidity at the head of the lough, which is the drowned continuation of the valley of the **Lagan**. Its docks and sheltered quays afford great advantages for ship-building, and ocean-liners of increasing sizes have been constructed here for British and European firms. The linen industry of the north centres in **Belfast**, though most of the neighbouring towns have their own bleaching greens. The wooded slopes along the **Lagan** on the south of the city have been developed as sites for numerous villas. The **Queen's University** of **Belfast**, and other educational institutions, lie on

this side. Many of those who are engaged in Belfast by day live, however, on the shore of the lough in County Down. The situation of the city is very striking as one approaches it from the south, with the great black crags of Cave Hill rising beyond the houses more than a thousand feet against the sky. As an industrial centre it has many advantages over the far more smoky towns of northern England.

23. Lisburn lies farther up the Lagan, and has an important trade in linen.

24. The county of **TYRONE** contains as a backbone the moorland of ancient rocks between Omagh and Cookstown, which is continued into the granite of Slieve Gallion. The mica-schists of Donegal and Londonderry spread into the north of the county ; but there are Carboniferous rocks south of Castlederg, followed by a great band of Old Red Sandstone running from the Erne valley nearly to Dungannon. The plateau of Slieve Beagh, which is formed of shale and sandstone like the hills around Lough Allen (p. 100), forms a conspicuous feature on the southern border. At Dungannon and Coalisland one of the few Irish coalfields occurs, partly covered by soft sandstones and by the deposits of Lough Neagh, which were formed when this lake extended farther southward. The Carboniferous Sandstone in this region has been much used for building.

25. The border of the county runs along the Foyle, and then westward into the moors where

the River Derg rises. It returns along the watershed between Lough Erne and the Strule River. From the Slieve Beagh plateau eastward the Blackwater is used as a boundary. Part of Lough Neagh is included in Tyrone, and the north-east border of the county crosses the end of Slieve Gallion and runs along the high ridge of the Sperrin Mountains. The river-system of the county centres in the Strule and its continuation as the Mourne, into which streams pour from south and west and east. The margin of Tyrone, in fact, seems to have been laid out around this river-basin, the waters of which go to swell the Foyle below Strabane.

26. The one through-route in this hilly county runs from Dungannon to Strabane, taking advantage of the Mourne-Strule valleys. The bright town of Omagh stands at the west end of the central moors. Newtown Stewart and Strabane lie lower down the main stream. Castlederg lies away west, near the limit of the cultivated country. Several small towns have grown up on the road east of Omagh, and the whole route is now traversed by the railway from Portadown. Dungannon stands on a slope where the edge of the Carboniferous Sandstone rises above the limestone plain. Cookstown, traversed by a broad central street, which forms a busy scene on market days, is an important agricultural centre, and has linen industries, like so many northern towns. In the south of the county, Fivemiletown, Clogher,

and **Aughnacloy** lie on a road that follows the river valleys within the county border, and a light railway now runs through them, connecting them with Armagh and Enniskillen.

27. **FERMANAGH** has been marked out along the broad valley of the Erne, where the river expands into a band of lakes. These run from south-east to north-west through the centre of the county. The uplands of Tyrone lie on the north-east, and the sandstone and shale plateaus, including Cuilcagh, rise above the limestone basin on the south-west. At Lough Melvin the county nearly reaches the sea, and we look from its edge down a broad valley to Bundoran. Except for Slieve Beagh, which forms the angle, the eastern border with County Monaghan has no geographical interest.

28. The main floor of the county, the hollow of the lakes, consists, then, of Carboniferous Limestone. Numerous islands lie in both Upper and Lower Lough Erne, as relics of the older surface along which the river system has worked its way. The Erne between the two lakes winds this way and that, including a number of other islands. The country is beautiful throughout, with contrasts of wooded lake-shores and bold hills rising as a background. At **Belleek**, where the rapids of the Erne run in a little gorge towards the sea, the scenery unites that of the high limestone of Leitrim with that of the moors of Donegal. The well-known pottery-works in this charming little town were established on account of the nearness of the

granite on the north side of the Erne ; but the felspar used for the china is now imported.

29. **Enniskillen** lies centrally at the head of Lower Lough Erne, where the great routes of the county meet. The railway from **Dundalk** to **Bundoran** goes through it, and branch lines run to **Sligo** and **Omagh**. The scenery to the west, near **Belcoo**, where the Macnean lakes lie under Carboniferous Sandstone hills, contains interesting examples of streams which disappear into or appear from the limestone and form a fine series of caves.

30. **Lisnaskea** and **Newtown Butler** are villages on the Dublin road.

31. **MONAGHAN** contains limestone in the north ; but the south rises as a hummocky land on old slates and sandstones, forming part of the folded rocks that spread away north-east through County Down and into Scotland. Drumlins are frequent on the surface, and add much to its irregularity. The county-boundaries cut across streams and ridges, and the main continuous feature of Monaghan is the road to Dublin through **Clones**, **Ballybay**, and **Carrickmacross**. The railway takes a more easterly route from **Ballybay**, so as to reach **Dundalk**.

32. **Monaghan** town is prettily placed among cultivated drumlins and eskers on the limestone land. The Finn runs down from it to the Erne, and its railway-connexions are by this valley to **Clones** and north-east through **Armagh** to **Belfast**. **Clones** (the "fertile land of Eos"), an ancient settlement, is now an important

junction of railways on the western border. **Castleblayney** was built in the reign of James I., as a military station on the way to Monaghan. **Carriekmacross** stands on a relic of the limestone which once covered the slate-rocks of the county. The ridge rising south of it includes a very small and unworked coalfield.

33. The county of **ARMAGH** has the Blackwater for its boundary with Tyrone, includes a part of Lough Neagh on the north, and is marked off from County Down by a line running nearly north and south along the easiest passage from the lake to Newry. On the south it reaches to the edge of the wild upland above the limestone of Dundalk. Here it includes the bold hill of Slieve Gullion, which is due to igneous rocks that rose through the slates at the same time as the granite of the Mourne (p. 46). The great part of the county consists of old folded slates and sandstones ; but Carboniferous beds remain in the north near Armagh city, and at Portadown we reach the northern basalts, the soft red sandstones, and a flat shore of clays that represent a southward extension of Lough Neagh. **Portadown**, one of the great towns of the linen industry, occupies a natural position in this lowland on the broad stream of the Bann. The railways branch from it into the Lagan valley for Belfast and westward for Omagh and Londonderry. **Lurgan** lies near the eastern border. **Armagh**, with its two cathedrals, is finely placed on a hill above the limestone land.

St. Patrick chose this conspicuous site for one of his earliest churches, and the great mound of Emain in the neighbourhood, the stronghold of the Red Branch Knights, shows the importance of the place in very early times.

34. The granite that came up when the slates were being folded in the south of the county, and the far later igneous rocks of the Slieve Gullion region, form a moory upland unsuited to the growth of towns. Bessbrook has a linen industry, and lies conveniently above Newry; but the roads from the north cross a barren country to the gap at Forkill, a place often contested during fighting times in Ireland.

35. **DOWN** lies on the hummocky irregular country formed by the old slates and shales and sandstones, with the Newry and Slieve Croob granite running north-east in its centre, and the far younger granite of the Mourne Mountains making a fine knot in the south. The county is less hilly round Strangford Lough, which is a broad valley submerged beneath the sea. A small part of the basalt plateaus and of the shore of Lough Neagh come within the county near Moira in the north-west; but the boundary on this side for the most part follows the Lagan. From Belfast to Newry the county has a sea-board, the coast scenery becoming very fine under the Mourne Mountains and along Carlingford Lough. The Bann rises on the west side of the Mournes, some 2,000 feet above the sea.

36. The towns along Belfast Lough as far as Bangor contain numerous residences of people engaged in business in Belfast. Donaghadee and Newtownards arose from fishing villages. Banbridge, the most important town of the interior, is built along the old Dublin road. Downpatrick, picturesquely placed above the Quoile River where it enters Strangford Lough, contains the tomb of St. Patrick. The great moated Dun, representing the prehistoric town, is still well preserved. From its exposed position on the east coast, Downpatrick has suffered from invading armies at various times.

37. Newcastle, at the foot of Slieve Donard, has become a very favourite resort for visitors. The County Down railway from Belfast ends here; but a line has been made across to that from Dublin, the junction being at Scarva. The coast-road from Newcastle to Warrenpoint runs on a strip of low ground between the mountains and the sea. Rostrevor lies in a sheltered hollow on the north side of Carlingford Lough. Newry is a sea-port at the narrow head of the inlet, and is connected with the main railway by a branch to Goraghwood, which climbs the steep valley-side (p. 110). A line runs through it from Belfast, carrying passengers along the Louth side of the lough to the English steamers at Greenore.

38. The north-west of CAVAN spreads up into the highlands round Lough Allen, where the Shannon rises on the west side of Cuilcagh among sandstone heights. The county spreads south-

eastward across a limestone lowland covered with drumlins of boulder-clay, in which the loops and windings of Lough Oughter have been formed. It then includes an upland of shales and sandstones, part of the broad mass that here rises above the limestone plain. Lough Sheelin in the south lies on limestone, and drains into the Shannon at Lough Ree. The central part of the county lies in the Erne valley, while the south-east sends small streams down to the Blackwater of Meath and so into the Boyne.

39. Belturbet lies on the Erne below Lough Oughter. Cootehill is pleasantly placed near the Monaghan border, and is served by a line from Ballybay. Cavan town stands in a fairly wooded country on one of the great roads from Dublin to Enniskillen. It has grown up just where the rougher upland of slaty rocks passes into the fertile limestone land. The hamlet of Cross Keys stands at the top of the watershed under Slieve Glah, and Ballyjamesduff lies on the south-eastern slope. Kingscourt, on the west side of the coal-bearing ridge that comes down from Carrickmacross (p. 128), is the northern terminus of a branch line from Navan. Both this and the line in County Meath from Navan to Oldcastle stop short at the slaty upland, leaving the county of Cavan poorly served by railways, except for the main line that crosses to Cavan town from Mullingar.

CHAPTER X.

THE PEOPLE AND THE INDUSTRIES OF
IRELAND.*

1. The position of Ireland in regard to Europe has led to the occupation of the country by various migrating tribes. Whoever the first inhabitants of the country may have been, when the melting of the ice-sheets allowed of the settlement of man, there is much evidence in favour of the old traditions connecting Ireland with the Mediterranean. The people of the Mediterranean shores moved from the south of France and from the north of Africa by way of the Spanish coast to the Atlantic. Sailing and rowing in their light vessels up the west of France and across the English Channel, it is clear that some tribe or tribes of them discovered Ireland and planted themselves firmly on the soil. They brought with them arts and a fair civilisation, as may be easily recognised in the objects dug up from ancient tombs throughout the country. Their original language has been lost ; but it may have imparted some features to the Gaelic speech which grew up later in the land. The Celtic people who invaded

* The best modern guide to the industries of Ireland is "Ireland, Industrial and Agricultural" (1902), issued by the Department of Agriculture and Technical Instruction (Browne and Nolan, Dublin).

Britain and Ireland from central Europe about 600 B.C., bringing with them a knowledge of iron, no doubt produced a powerful impression on the language, and the latter in time spread, as we have seen, up into the highlands of Caledonia. Though the Romans never invaded Ireland, numerous seafaring rovers from time to time made settlements on its shores. A mixed population developed along the coasts, and there is no doubt that these hardy races brought strong blood with them to mix with that from the Mediterranean and the Celtic lands. The Normans in the twelfth century overran the country more completely than their relatives, the Danes and Norsemen, had ever done; they brought into Ireland customs and modes of thought acquired in the Roman lands of Europe, and they soon became closely attached to the island which they first had conquered with the sword. In the same way, later settlers who crossed from England into Dublin have felt themselves devoted to Ireland, and the fact that the country is an island marks it out more clearly as the fatherland of those who are born in it than England is marked out from Scotland or from Wales.

2. At the same time, the whole history of the land before man entered it shows that Ireland is closely related to the British Isles and Europe. The development of steam traffic across the Atlantic has made it seem a simple matter for the men of Cork or Kerry to reach the United States; but the daily business and commerce of Ireland are

naturally with the sister island to the east. Close ties of kindred unite the people of the north-eastern counties with those of Scotland (p. 112). The Norman and Norse folk in the east, mingled as they may be with older settlers, still remember northern Europe ; and the Mediterranean race, with its sympathy and natural refinement, which forms the foundation of all that we now regard as Irish, may well be proud of the adventurous wanderings that brought it to the outpost of the continent.

3. Just as the country has moulded the people in it, and has given us Leinstermen of the hills, farming folk in the great plain, and hardy seamen in the inlets of the west, so it has moulded their means of living and their trade. The absence of great coalfields has left the country poorer than southern Scotland or central England, but has spared it from the crowded life and smoke-laden skies that mark those wealthy lands. With an abundance of soil suited for grass and cultivation in the great plain, it is clear that agriculture must be the great industry of the country. Some of the earliest tales of Ireland relate to movements of cattle, and at the present day the immense requirements of England in the way of food-supplies provide a magnificent market close at hand. Although the area of land under cultivation has lessened, owing to the ease with which grain can be obtained from the European continent and America, the trade in cattle, butter, eggs, and even fruit is capable of still further development.

4. Flax is largely grown, especially in the north, to meet the requirements of the linen industry. Barley is usually in demand, owing to the distilling and brewing trades of the large towns. Oats seem less cultivated than in former times, in spite of their being suited to the damper climate of the west. Potatoes form an immense staple of food throughout the country, and are grown in a great variety of soils. Truly stiff unworkable clays, such as occur in some parts of south-eastern England, are practically absent from Ireland, and the immense mixture and distribution of material in the Ice-age have led to a wide prevalence of healthy loams.

5. Horse-breeding has been carried on with marked success in Ireland. Among the cattle, the small Kerry cow, with its remarkable production of milk, is probably the most specially Irish breed. Sheep are largely raised in the grasslands of the limestone region of Roscommon and eastern Galway. The great fields of the plain-land of Meath are mostly given over to cattle-grazing. Every county produces pigs, supplying material for the important bacon-industry, which is especially carried on in the south and west.

6. Fish can now be carried from the western ports by rail to meet the demand in England, and complaints are often heard that this demand is so continuous that fish cannot be had in Ireland where the population lives by fishing. In the same way, milk is often scarce where the export butter

trade is flourishing. The dairying industry, thanks largely to the co-operative system, has grown enormously in recent years.

7. We have already seen (p. 123) how Belfast has adapted itself to the industry of ship-building, which now includes almost every branch of engineering and a number of highly artistic trades. Linen became important when the woollen trade of the country was practically suppressed by law, and it received much encouragement in return for the abandonment of wool. The climate is suitable for the growth of flax, and flourishing businesses have been established in almost all the northern towns. Cloth-mills are at work throughout the country, and the woollen homespun materials, which are especially produced in Donegal and Mayo, meet with a ready sale.

8. Where the population is scattered, a number of home industries have sprung up, the products being collected by buyers, who convey them to the towns. The homespun trade is thus carried on to a large extent on looms in cottages. Lace-making receives encouragement in the same way, and Irish lace and crochet-work have a wide reputation. Much of the sewing for the linen trade is done by workers in their own homes.

9. Ireland cannot be regarded as rich in minerals, though at one time gold must have been largely collected from the gravels near Woodenbridge in County Wicklow (p. 73). A nugget weighing 22 ozs. was found here in 1795. Copper has

been successfully mined on the Waterford coast and west of Castletown Bearhaven in County Cork, and boring may in time reveal further large bodies of ore in these southern districts. A number of iron ores were formerly worked when wood was abundant for smelting them on the spot. The bedded ores among the basalts of County Antrim are exported, and stores of nodular carbonate of iron remain in the Lough Allen area. The brown bog-iron ore is raised in places for use in the purification of gas. Lead, in the form of the common grey sulphide, frequently occurs in the limestone districts ; but mines are not now profitable.

10. **Bauxite**, a material looking like a clay, but very rich in alumina, occurs in layers associated with the iron ores of Antrim, and is mined at several places north of Belfast for the manufacture of alum. **Rock-salt** occurs in beds nearly 100 feet thick in the red rocks under the chalk near Carrickfergus. **Barytes** (sulphate of barium) is mined on the Leitrim and Sligo border and in the south-west of County Cork. A friable white earth known as *kieselguhr*, composed of the siliceous cases of minute water-plants, is dug from a considerable bed just beneath the soil at the outlet of Lough Neagh. It is used for bricks round cold-storage warehouses, owing to its slowness in conducting heat ; also as a polishing powder, and for a number of other purposes.

11. The **brick-clays** of Ireland often come from the boulder-clay ; but some of the old shales are

artificially ground up again into clay, and good material is also found in the red strata of Belfast.

12. Ireland is rich in **building stones**. The grey Carboniferous Limestone and the yellowish sandstones of Mount Charles (p. 116) and of Dungannon (p. 124) have been largely used. Black **marble** occurs near Galway and Kilkenny, and red varieties are quarried near Cork. The streaky green serpentinous marble of the south of County Galway (p. 107) is greatly prized as an ornamental stone.

13. The nearness of the remarkable quarries in Wales prevents Irish **slates** from being widely used ; but slate has been quarried at Killaloe, at Valencia Island, and near Carrick-on-Suir.

14. The Irish **granites**, notably that of the Leinster Chain, have been freely used in building ; but the many handsome varieties among the older rocks of Galway and Donegal still await full development. The granite of the ridge near Newry (p. 109) is worked for setts, and also as a good grey ornamental stone.

15. **Coal** occurs in the north at Ballycastle, round Lough Allen, and at Coalisland, north of Dungannon, and there is still much to be raised from these fields. An immense amount of coal-bearing strata was worn away from the uplifted country even before the red sandstones of Tyrone and Antrim were laid down (pp. 124 and 121). A high and considerable coalfield remains, however, in Leinster between the Barrow and the Nore ; the

material here is anthracite, containing less gas than that of the northern areas. An extension of this field runs westward into Munster; but the few seams in the wide Carboniferous plateau in Clare and Limerick are not sufficient to encourage exploration.

16. Peat is justly valued as a clean and handy fuel by the peasantry throughout the country. It is possible that some of the large bogs in the plain may be used for the production of gas, and in this way for the driving of machinery to transmit electric power. Work in this direction is already being done near Portadown. A large part of the bogland in the west is connected with small holdings, and the possession of fuel on the farm tends to become of greater and greater value as the price of coal is raised.

CHAPTER XI.

CONCLUSION.

THIS little book is not going to end with a reference to the price of coal or of any other article. There are things in Ireland far more lasting than a hundred pounds in the bank or a good position in the market square. When we look at the hills and valleys, we cannot help thinking of the men and women who knew them also in the old times, who gathered wood in the forests to light their fires in ringed encampments, and who heard the wind blow round them from the sea, while they said to one another, "Here we have made a home." The tales of the old folk, long before history was written down, are full of the names of mountains and pleasant plain-lands, and of green raths placed above the streams. There was then much burning of homesteads, harrying of cattle, and clamour of heroes meeting at the ford. But the clearing of the savage woodland, the first tilling of the soil, the hands-grasp of friends, and the gracious arts of intercourse—these things, scarcely noticed by historians, were moulding the fellowship of a people. Family by family, age by age, an Irish race has grown in Ireland. Through her eastern gate and her Atlantic harbours her people have gone out across the world ; but they look back to the green

hillsides, to the white rivers widening into lakes, and the sweet air of the moorland, soft with rain. This book is written for those who learn and work in Ireland, and what they love best in her they will read into it for themselves.

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